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NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

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Judgment for I.C.I.

THE prolonged patent action relating to certain selection patents governing the manufacture of azo and monoazo dyestuffs between Imperial Chemical Industries and the I.G. Farbenindustrie ended on Thursday in Mr. Justice Maugham's judgment that all three German patents involved are invalid. The judgment itself is important as between the parties and in relation to dyestuff makers generally, because the originating patents of 1912 and 1913, which expired in 1928, are thus freed from the limitations imposed on their use by the selection patents in question. In other words, the monopoly created by the original patents of 1912–13 and continued, as the petitioners claimed, under the selection patents disappears for good.

The judgment, however, which was a particularly scholarly, thorough and clear exposition of the case, will be cordially welcomed on another ground—namely, the clear terms in which for the first time the conditions that a valid selection patent must comply with are defined. His Lordship made a very strong point of the practical tests, which showed little or no distinction between the effects produced by selected and unselected groups of dyestuffs. From this point of view, the German respondents have gained something, though they have lost the first trial, for if this judgment becomes a leading case it will determine in clearer terms than ever before what a selection patent really must be.

The judgment was listened to in a not very crowded court by a group of leading dyestuff experts, both English and German. It was evidently regarded as a masterpiece of careful analysis and exposition of particularly complicated issues, and the closeness of its reasoning was followed by both sides. It was originally understood that in any event the case would go to the House of Lords, and this possibility of appeal probably explained the unusual length and care of the judgment. Whether an appeal, in view of Mr. Justice Maugham's unqualified decision against the validity of all three selection patents, will be persisted in remains to be seen.

Progress in Fine Chemicals

THE new *Directory of British Fine Chemicals*, issued by the Association of British Chemical Manufacturers, supplies further evidence of the steady progress that is being made in this field by the 37 British firms, members of the Association, engaged in fine chemical production. As the manufacture of fine chemicals is recognised as a key industry of vital importance to the Empire in times of peace as well as in times of war, the Association naturally has a right to expect support from users of fine chemicals, in their endeavours to maintain the now successful and proven British fine chemical industry. While the list is representative of the fine chemicals made in this country, and is fairly comprehensive, it does not claim to be exhaustive, as chemicals only in very infrequent demand have not been included, though their preparation may have been, or can be, undertaken if required. Again, in view of the limitations of space, numerous salts, especially of the alkaloids, have not been detailed; the more common of these salts are, however, usually available from stock, and others can be prepared at a few hours' notice. All the fine chemicals listed are actually manufactured in this country, and are generally obtainable at short notice; there are, however, certain chemicals in the list, a permanent supply of which cannot be guaranteed unless there is a sufficient demand.

The support given by British research chemists and by all users of fine chemicals has grown with the years since the publication of earlier editions of this list. There is, on the other hand, room for further development of the practice of demanding British fine chemicals, and the past progress of the industry is ample justification for the claim that the British manufacturers can

satisfy the demand for fine chemicals of the highest quality. The co-operation of the research chemist and the public is therefore requested in continued and undivided support of the industry. As an indication of the progress which has been made in establishing the industry in this country during the past eight years, it is stated that the present list contains the names of some 3,000 fine chemicals, whereas the 1922 edition contained only 1,800. All the distributing houses are in possession of this list, so that orders may be sent through the usual trade channels. In special cases, of course, applications can be sent direct to the manufacturers, when they will be dealt with according to the custom of the firm concerned. All questions of difficulty and inquiries for chemicals not listed in the present volume may be referred to the Association of British Chemical Manufacturers, when every endeavour will be made to ensure the manufacture of such chemicals.

A Patent Office Warning

An official warning has been issued by the British Patent Office to applicants for patents about communications from persons offering their services for negotiating the exploitation of the inventions or for obtaining foreign patents. Attention is drawn to the fact that no person in the United Kingdom may obtain foreign patents for gain unless he is a registered patent agent. Chartered patent agents do not issue such communications (other than notices to their own clients), and a chartered patent agent of many years' experience states that he personally does not know of any person, firm, or society sending out such communications whose services are likely to be helpful. All chartered patent agents are registered, but a registered patent agent is not necessarily a chartered patent agent.

The Inevitable Combine

In expressing to a meeting of Liverpool chartered secretaries on Monday the view that "our problems are not going to be solved by large combinations," a speaker quoted the case of the late Sir John Brunner and Dr. Ludwig Mond. Mr. Brunner, he said, borrowed £5,000 and started off with Dr. Mond. What chance is there to-day, he asked, for the rise of Brunners, Monds, and Levers? To this Mr. Henry Mond, a grandson of Dr. Ludwig Mond and himself a director of Imperial Chemical Industries, makes the plain reply that it is useless trying to put the clock back. It is not a question of wanting or of not wanting rationalisation, but of having to adopt what is essential to our survival. Against the immense combines of Germany and America, it is impossible for a bundle of little firms, all following different methods, to compete.

Admitting that the conditions in which the famous Brunner-Mond partnership was established are gone for good, Mr. Henry Mond still contends that within a great combine there may be ample scope for individual initiative and ability, even greater scope than could possibly have been offered fifty years ago. The search, indeed, to-day is for men capable of carrying the responsibility of managing, subject to a general central policy, large departments or branches of industry, very much larger than whole businesses in former days. And in proof that the way is still open for commercial genius, he mentions that several members of the board of Imperial Chemical Industries have risen from the rank of office boys. The continued vitality, indeed, of these huge concerns depends on the ability of those at the head to attract and to offer adequate scope and reward to the type of men to whom they can safely delegate their responsibilities. In this as in most cases what is lost in one direction is regained in another. The essential feature in all systems is that each should be efficiently worked.

Books Received

Some Writers on Lime and Cement. By Charles Spackman. Cambridge: W. Heffer and Sons, Ltd. Pp. 287. 15s.

The Textile Recorder Year Book, 1930. London: John Heywood, Ltd. Pp. 930. 7s. 6d.

The Beginnings of Chemistry. By Harriett Beale. London: George Allen and Unwin, Ltd. Pp. 243. 4s. 6d.

Katalytische Reaktionen in der Organisch-Chemischen Industrie. By Dr. Ing. Horst Bruckner. Dresden and Leipzig: Theodor Steinkopff. Pp. 168. Rm. 16.

The Chemical Manufacturers' Directory for 1930. London: Simpkin Marshall, Ltd. Pp. 208. 4s. 6d.

The Calendar

Mar.		
15	Royal Institution: "Atom Nuclei and their Structure." Sir Ernest Rutherford. 3 p.m.	21, Albemarle Street, London.
17	Institution of the Rubber Industry (London): "The Rationalisation of Research in the Rubber Industry." 7.30 p.m.	Engineers' Club, Coventry Street, London.
18	Institute of Chemistry and Society of Chemical Industry (Edinburgh Sections): "Chemistry in Naval Warfare." Professor Kendall. 7.30 p.m.	36, York Place, Edinburgh.
18	Institute of Metals (Birmingham Sections): "Nickel-Chromium Alloys." W. R. Barclay. 7 p.m.	Chamber of Commerce, New Street, Birmingham.
18	Institution of Petroleum Technologists: Annual general meeting. 5 p.m.	John Street, Adelphi, London.
18 & 19	Society of Glass Technology ..	Stourbridge.
19	Royal United Service Institution: "The Chemistry of War." Major F. A. Freeth.	London.
19	Society of Chemical Industry (Nottingham Section): "Some Derivatives of Cellulose and their Industrial Application." Dr. H. Levinstein. 7.30 p.m.	University College, Nottingham.
20	Royal Society: Discussion on "Catalytic Reactions at High Pressures." Opened by Professor G. T. Morgan. 4.30 p.m.	London.
20	Institute of Chemistry (Manchester Section): "Science and Philosophy." A. D. Ritchie.	Manchester.
20	Chemical Society. 8 p.m.	Burlington House, Piccadilly, London.
20	Society of Chemical Industry (Birmingham Section): Annual meeting. 6.30 p.m. "A Wood Distillation Factory in Jugo-Slavia." Dr. W. R. Ormandy. 7. p.m.	Chamber of Commerce, New Street, Birmingham.
21	Society of Dyers and Colourists (Manchester Section): Papers by A. J. Hall, J. R. Hannay, J. M. Preston, Miss Eva Hibbert. 7 p.m.	36, George Street, Manchester.
24	Society of Chemical Industry (Yorkshire Section). Annual meeting. Discussion on the "Fundamentals of Lubrication," to be opened by Dr. N. K. Adam.	Leeds University.

End of the Great Dyestuffs Patent Action

All Three German Patents Invalid

On Thursday in the Chancery Division, High Court of Justice, Mr. Justice Maugham, sitting with Professor A. Smithells, President of the Institute of Chemistry, as chemical assessor, delivered his reserved judgment in the motion by the I.G. Farbenindustrie Aktiengesellschaft in the matter of letters patent Nos. 193,834 (*a*), 193,866 (*b*), and 199,771 (*c*) under the Patents and Designs Acts, 1907 to 1919, and a petition of Imperial Chemical Industries, Ltd., in the matter of the same patents.

The petition by Imperial Chemical Industries, Ltd., was for the revocation of the letters patent of the I.G.—known as selection patents—on the grounds of prior publication, prior common general knowledge, and insufficiency of description. The subject matter of the patents related to dyestuffs and a particular class of dyestuffs known as azo dyestuffs. By their motion the I.G. sought an amendment of each of the three specifications in question. The motion was under section 22 of the Patents and Designs Act, which enables owners of patents, for the time being, to sue for leave of the Court to amend the specifications.

The hearing of the evidence and counsel's speeches occupied the Court for about 20 days.

Mr. Whitehead, K.C., and Mr. Trevor Watson, K.C., appeared for the respondents; Mr. Stafford Cripps, K.C., and Mr. Lloyd Jacob for the petitioners. The Comptroller of Patents was represented by Mr. Stafford Crossman.

Judgment

His Lordship, in a long and exhaustive written judgment, said the petition by the I.C.I. was for the revocation of three letters patent. The respondents, the I.G. Farbenindustrie, gave notice to amend their specifications in regard to the patents, and this application was opposed by the petitioners. The questions which arose were of a difficult character. It was necessary to determine first whether the patents were to be amended, and whether, if amended or unamended, they were valid. The inventions related to a class known as mono-azo dyestuffs. The problems in regard to these matters were of a complex chemical character. In this case the difficulties were reduced by an agreement being arrived at on the chemical points. The respondents sought to uphold the first patent, as a selection patent, as possessing peculiar advantages.

The claim for the second patent was that it did not present any fresh chemical question.

With regard to the third patent, it was urged that no new chemical point arose here either.

It was not disputed that the Court were here dealing with dyestuffs to be used for dyeing shirtings and cotton goods of that character. In this matter he had to consider the evidence given in regard to commercial practices in this country. Dyestuffs must possess some qualities of fastness. The promise as to the fastness to kier boiling must be regarded in the light of a promise to commercial men. The promise must be regarded as equivalent to kier boiling. It implied ordinary kier boiling of dyed cotton goods. His Lordship regarded the promise as a promise that would give quite excellent results and have excellent fastness to kier boiling. The promise must be construed as one of real advantage to be obtained by the ordinary use of the patented dye. The respondents sought to establish that kier boiling in the specification related to caustic soda boiling. But evidence such as kier boiling would be a new departure. Few goods dyed by the selected dyestuffs could resist the ordinary caustic soda boiling.

Under these circumstances he thought the promise would be bad from ambiguity and insufficiency. The promise the respondents had made led to great difficulties.

First Case of Chemical Selection Patents

His Lordship believed that this was the first time that chemical selection patents had come before the Courts for construction. The Court was not concerned with the state of the mind of the inventors. In the selection group all that was here set out by the respondents was that they possessed advantages. In his Lordship's opinion, in a selection patent, the inventive step must contain useful and special properties and characteristics, adequately defined. He was of opinion that section 22 of the Patent Acts precluded him from authorising the amendments asked for in patents (*a*) and (*b*). He could not, therefore, order an amendment of (*a*) and (*b*), and the motion for these amendments would be rejected.

Dealing with patent (*c*), he came to the conclusion that it possessed good qualities, and *prima facie* he ought to allow the amendment of this patent.

The respondents claimed that their dyestuffs possessed excellent fastness to kier boiling. He did not think it was necessary to go into this matter exhaustively.

His Lordship found as a fact that no such advantage existed by the selection dyeings over the un-selected in relation to commercial caustic boiling as to justify the promise made by the respondents. Fastness to kier boiling was the primary claim of the patents.

Patents Invalid

His Lordship, summing up the whole case, said:—

My conclusions on the three patents must be as follows:—

First, as a matter of law, there may well be a selection patent, but it must be a selection for a useful and special characteristic or property, indicated in clear terms by the patentees.

Secondly, on the construction which I have placed on the promise in relation to fastness to kier boiling, *i.e.*, fastness to a practical soda ash kier boil, the promise wholly fails.

Thirdly, on the construction which the respondents seek to place upon the promises, *i.e.*, a greater fastness to caustic soda kier boil in comparison with other similar dyestuffs to a varying degree, the characteristic as established is too vague, too uncertain and (nitro compounds being included) open to too many exceptions to enable the patents to be supported.

Fourthly, as regards patent (*c*), the promise in relation to discharge properties fails.

Professor Smithells, who has afforded me great assistance in dealing with the chemical difficulties of the case, agrees with me in all my findings of fact on the evidence adduced.

In the result the three patents must be held to be invalid, with the usual consequences.

Mr. Trevor Watson asked for a day to discuss the question of costs, and his Lordship said he would fix a day later.

Diesel Engines for Road Transport

Lecture to Petroleum Technologists

"The Diesel Engine as Applied to Road Transport" formed the subject of a lecture by Major W. H. Goddard at the Institution of Petroleum Technologists in London on Wednesday night.

Until recently, he said, no great progress in Diesel transport had been made, but a considerable increase in the number of Diesel-engine-driven vehicles should be apparent very soon. Several manufacturers were now busy experimenting, but actual production had not been attained. Unless manufacturers awakened and produced a really good Diesel that would compare favourably with those produced on the Continent progress would still be slow.

Comparing existing petrol engines with Diesel engines, Major Goddard said Continental engineers had fully tried and tested a Diesel engine which would do the same work at, roughly, one-sixth of the fuel cost. With the saving of time by quicker starting, high average speed and more general reliability, the total running costs of a Diesel were about 50% of the costs of a petrol engine. At the moment there was an import duty of 33⅓ % on these machines.

For the manufacturer who could produce a satisfactory Diesel engine in this country a great harvest was waiting. The engines would run nearly equally well on five different grades of oil and would provide an opportunity for the use of home-produced fuel from the new low temperature carbonisation processes.

Structure of Fats and its Bearing on their Utilisation

By Professor T. P. Hilditch

At the John Cass Technical Institute, London, on Thursday, with Dr. E. F. Armstrong in the chair, Professor T. P. Hilditch, of the University of Liverpool, comprehensively reviewed the chemical structure of fats, and explained its bearing on their utilisation in the production of edible products, soaps, paints and varnishes, etc. The following summary gives the main points in the lecture.

THE utilisation of fats in edible products (butter, margarine, cooking fats, confectionery), for soap making, in paints and varnishes, or for other purpose, involves at the present time the consumption of several million tons per annum of natural fats, and the existence of very large industries, employing large numbers of people, which are dependent on the natural fats as raw materials.

Fats and Fatty Acids

There are many different kinds of fats and fatty acids found both in the fruit of plants and in animals, some solid, some liquid and some semi-solid. Of the solid fats, some are hard and brittle; others, even though they melt at a higher temperature, are softer and more plastic in texture, and of the liquid fats (or oils) some will keep more or less unaltered on storage, whilst others become gummy or thicken on exposure to air. These varying properties make some fats especially suitable for butter or lard substitutes or for other edible ends; other fats make useful soap-making material, and yet others ("drying" oils) are adapted for use in the preparation of paints.

A number of more or less rapid analytical tests have been devised by means of which those engaged in the production of any of these commodities can readily assess the utility of any given natural fat for their particular service, but technical analytical methods of this nature do not, as a rule, tell us very much about the chemical structure of the fats. Nevertheless the usefulness of a particular fat depends ultimately on its fundamental chemical structure and it is, therefore, desirable to have as complete a knowledge as possible of the latter.

Industrial Uses of Natural Fats

Up to the present some 1,400 different natural fats have been examined, of which number perhaps between 100 and 200 find technical use in one form or another. It has been known for more than a century that all fats are mixtures of chemical compounds known as glycerides, formed by union of glycerol with three groups or molecules of fatty acids, but it is only comparatively recently that the quantities and kinds of fatty acids characteristic of particular fats have received detailed attention, whilst the manner in which they are bound up with glycerol is only at present becoming clearly understood.

The reasons for this apparently slow development of knowledge do not lie in any particular complexity of the fatty acids (which, as organic chemical compounds go, are rather simple in structure), but in the facts that nearly 40 different fatty acids have been observed in one or other of these fats; that the number of different fatty acids in any one fat is never less than 3 or 4 and may be as many as 15; that in the great majority of cases two or three different fatty acids are linked to the same glycerol molecule, so that the whole fat or mixture of glycerides is very complex; and that the different fatty acids are built up for the most part on very similar lines and are therefore not easy to separate quantitatively.

On the other hand, the specific utility of a fat depends ultimately on (*a*) the kinds and proportions of the individual fatty acids present in combination with glycerol and (*b*) the manner in which these are linked up with glycerol as natural glycerides. Consequently, there is considerable incentive to investigators in both these directions. Much progress has been made in the last 10–20 years in accumulating detailed analyses of the fatty acids present in numerous fats, and reliable data of this kind for 150 or more fats (including most of those in common use) are now available. The second problem (the structure of the glycerides themselves) is much more difficult, but definite advances have recently set in in this field.

A Complicated Study

The subject of fats is full of paradoxes. The constituent fatty acids are so simple in structure as to have proved relatively uninteresting to organic chemists, yet by reason of their simplicity and similarity and their complex mode of union with glycerol in nature, the resulting fats are usually most complicated mixtures which have proved singularly difficult for the chemist to unravel. Again, in the vegetable kingdom, which, from a biological standpoint, is in many ways simpler in functional mechanism than the animal, we find numerous specialised fatty acids which are never, or rarely, encountered in animals, and also the structure of the glycerides themselves in seed-fats appears to be oriented on more well defined and less haphazard lines than in many animal fats. Furthermore, the most complex forms of animal life appear to produce, or at all events to accumulate, fats containing the simplest group of fatty acids met with in nature, namely, palmitic, stearic, oleic and linoleic acids.

Comparison of Classifications

It is very interesting to classify the detailed data available at present for the fatty acid compositions of different natural fats according to the predominance, in a broad way, of one or more particular fatty acids, and to compare the resulting list with the classification adopted by the biologists for the plants or animals in which the fats originated. It is found that, so far as the existing information takes us, there is a remarkable connection between the two classifications.

Thus, in the fats present in seeds of various kinds, two acids, lauric and/or myristic, are especially prominent in seeds of the *Palmæ*, *Myristicæ* and *Simarubaceæ*; erucic in *Cruciferæ*; petroselinic in *Umbelliferæ* and *Araliaceæ*; Chaulmoogric and hydnocarpic in *Flacourtiaceæ*; arachidic and lignoceric in *Sapindaceæ* and certain members of *Leguminosæ*; whilst a few acids are even almost peculiar to certain genera or species—elaeostearic to *Aleurites Fordii* and *Montana*, ricinoleic to *Ricinus communis*, tariric to *Picramnia* species. The majority of seed-fats, however, have only four predominating acids—palmitic, stearic, oleic and linoleic; yet in these cases stearic is present in greater amount than palmitic in seed-fats of five botanical families, whilst the relative proportions are reversed in 13 other botanical families. In 11 other families, finally, the proportion of palmitic and stearic acids is very low, and oleic, linoleic (and linolenic) acids predominate. This group includes nearly all the more familiar "drying" oils used in the paint and varnish industries.

Marine, Non-marine and Vegetable Sources

Again, in the animal kingdom, many of the common fish oils and even those of the ordinary whales contain similar mixtures of fatty acids, which are entirely differentiated from any vegetable or non-marine animal fatty oils by the presence of large quantities of peculiar unsaturated acids known as palmitoleic, doleic, cetoleic, elupanodonic, etc. The only exceptions met with so far are certain abnormal types of oil, such as that of the sperm whale, which contains higher fatty alcohols in place of glycerol, and those of the shark and ray group, the liver oils of which contain large amounts of hydrocarbon as well as fatty oil. In these cases the fatty acid composition, although still different from that of fats of non-aquatic origin, is also different from that of the average fish, the oil of which is practically all fatty or glyceridic in nature.

Finally, as already stated, the fats of carnivora, herbivora and man contain, for the most part, the simple mixtures of palmitic, stearic, oleic and linoleic acids.

To a large extent, therefore, and in general terms, the composition of the fatty acids of the natural fats is characteristic for particular biological families, genera, or even species; at the same time, within certain limits, there is variability in the actual amounts of any one acid present in a fat from the same species, such variations probably depending on factors such as climatic conditions, life history and habits, stage of development of the organism, etc.

The great differences in kind and amount of the various fatty acids present in these natural materials are not accompanied by parallel differences in the manner in which they are assembled into glycerides. So far as our present information goes (and it is still in a rudimentary condition) the structure

of the glycerides seems to be determined solely by their place of origin in the plant or animal and to be of two sharply defined kinds :—

(*a*) Glycerides in which the fatty acid molecules are woven into combination with glycerol in such a way that a maximum even distribution of the fatty acids among the glycerol molecules has taken place. So far this has only been observed in vegetable seed fats, but within this category it appears to be a rule almost without exception.

(*b*) Glycerides in which the fatty acids are thrown into combination with glycerol in a more fortuitous fashion and, apparently, much on the lines on which probability would determine the combinations in which a number of differently coloured balls could be withdrawn, haphazard, three at a time, from a bag in which a large number were present. Animal body and milk fats, pericarp or fruit flesh oils of plants, and artificially prepared fats made by heating fatty acids and glycerol together fall into this class.

Experimental Data Still Lacking

It should be noted that experimental data are yet lacking on this point for many fats, especially those of animal organs such as liver, etc., oils.

Sufficient is already known, however, to indicate the considerations, which, for example, broadly determine the characteristic consistency of butter-fat as contrasted with that of coconut fat or cacao butter. To simulate completely the physical texture of butter is not only a matter of having approximately the same proportions of mixed fatty acids present, but of combining these in a similar manner to that of milk-fat, so that there are about 30 per cent. of fully saturated glycerides present, with a molecular ratio of about equal parts of saturated and unsaturated acids in the mixed saturated-unsaturated glycerides. Whilst it is probably economically unnecessary closely to approach this ideal, it may yet be pointed out that fats present in animal tallows are built up on these lines. So to a certain extent is palm oil, whilst coconut oil and palm kernel fats or soft oils such as cottonseed oil belong definitely to the other evenly distributed class of glycerides.

On the other hand, certain seed fats of which cacao butter is an outstanding example, contain substantial amounts of only three fatty acids, oleic, palmitic and stearic, and their proportions are not very far from equimolecular. Consequently, by reason of the " even distribution rule," they contain large proportions of oleopalmitostearin (as has been experimentally proved), and thus come closer in physical properties to those of an individual compound ; they have a low but sharp melting point, and, for fats, are exceptionally hard and brittle. They are thus especially suited for use in confectionery.

The " Drying " Oils

In another class of oils, the " drying " or paint and varnish oils, both the nature of the fatty acids and the structure of the glycerides play an important part. All highly " unsaturated " fatty acids absorb oxygen from the air very readily, and become converted into thick, almost solid, gelatinous or horny substances. If the acids are extremely unsaturated, as in fish oils, the products are gummy and thick and do not cohere readily into solid films, but with less unsaturated acids, especially mixtures of linoleic and linolenic, the products of oxidation or " drying " are transparent coherent solid films.

Thus fatty oils containing mixed glycerides of these acids are most suited for paint oils, and such oils are found in various seeds, such as linseed, poppyseed, perilla, walnut seed, hemp seed and others. These seed oils, however, invariably also contain combined oleic acid, which is not a " drying " agent, its state of unsaturation being too low. Owing, however, to the operation of the " even distribution " rule in glyceride structure, it is probable that, so long as the more unsaturated acids are present well in excess of the oleic acid, each molecule of the latter is partnered by two of the more unsaturated components. In these circumstances the final oxidised product is a suitable solid film, in spite of the presence of more or less oleic acid in combination.

Choice of Raw Material

To trades where the fats are broken up into their constituent acids and glycerol—soap-making being by far the most important—the structure of the original fat is of no great interest, and the main concern is the nature and the amount of the fatty acids present.

The variety of fatty acid mixtures in the hundreds of natural fats which are available (though only a fraction have yet been commercially exploited) may be found to satisfy the needs of practically all the industries concerned. Two ultimate developments of these lines of work suggest themselves : (*a*) To collect detailed fatty acid compositions of all fats likely to be of any industrial use, and, where necessary, to obtain sufficient analyses to cover any likely range of variability within the same species or variety of plant or animal ; (*b*) to determine the particular strains or varieties of plant species which will give the best yield of fatty oil of desired composition under given conditions of climate, soil, etc. Combined efforts by chemists and agriculturists on scientific lines should, in the course of time, make great improvements in the standardisation of fats as raw materials.

Cultivation of Oil-bearing Plants

Indications of what is likely to happen in this manner are afforded by comparison of plantation coconut and palm kernel and palm oils with the native-produced fats from the corresponding wild trees ; these are already matters of course, but the scientific cultivation of other oil-bearing plants is also coming into being in various parts of the world, notably of late years in the United States, where soya beans, *Aleurites* (China wood) trees and *stillingia* oil trees are already in bearing on a practical scale.

Beginnings are also being made in parts of the British Empire, especially Malaya, Kenya and West Africa, and experimental crops of China wood (tung oil) trees, rubber seed, perilla and some other plants are being systematically tested. Yet, bearing in mind the wide climatic and agricultural resources of the Empire and the opportunity for opening up fresh tracts of cultivated land on these lines, progress within the Empire is all too slow, and the efforts already made by the Government Departments concerned to promote these developments deserve encouragement, but also require to be intensified and fortified by the close co-operation of chemists, biologists and agricultural experts.

The Chairman's Speech

Dr. E. F. Armstrong (the Chairman), after complimenting Dr. Hilditch on the excellence of his address, referred to the importance of the fats as affording material for the study both of interactions in organic chemistry, of structure from the point of view of physical, particularly X-ray analysis, and of function, in plant and animal physiology. For a variety of reasons progress in the study of this group of substances had rather lagged behind that in other sections of chemistry. The work begun in the Crosfield Industrial Laboratories and continued by Dr. Hilditch and his assistants at the University of Liverpool was probably among the most important going on in any organic laboratory at the present time. The experimental difficulties were considerable and progress was and would necessarily be slow, but over a period of years it was certain that results greatly enriching our knowledge of molecular structure and of chemical physiology would be obtained. Such questions as the why and the wherefore and the whereabouts of the unsaturated linkings or double bonds in the higher fatty acids, characteristic of certain fish oils, would have been answered. Accurate knowledge would be obtained both of the nature of the glycerides and of the proportions of the various fatty acids in all oil-bearing seeds and plants, so that an understanding of the relation between these and the botanical classification could be achieved.

The explanation why the natural fatty acids contained an even number of carbon atoms, their degradation and synthesis, were all fascinating problems for the future. The nature of fatty films on water of monomolecular thickness, their orientation to the surface, the behaviour of fatty acid molecules as very long straight carbon chain compounds, and the confirmation of this conception of the chemist, based on his scheme of molecular architecture, by the result of X-ray measurement, presented subjects giving opportunity for so much vigorous thought to the mentally alert searching after novelty that it was, in very truth, a surprise that the fats to-day were not the most fashionable field of research instead of almost occupying the position of a Cinderella.

Insulation of Heated and Cooled Surfaces

Exhaustive Survey of the Problem

At a joint meeting on Friday, March 7, of the Chemical Engineering Group with the Glasgow Section of the Society of Chemical Industry in Glasgow, a paper, containing elaborate tables, etc., on "The insulation of heated and cooled surfaces" was presented by Messrs. J. S. F. Gard, B.Sc., A.I.C., and R. S. Robinson, B.Sc. Some extracts from the paper are given below.

MODERN power production and utilisation is continually directed to greater economy and higher efficiency. Of industrial and national importance is the cheap production of energy, either as power or heat, and its use under the most advantageous conditions. The cost of power depends upon the price of fuel, and the conservation of fuel is bound up in the conservation of heat.

One aspect of heat conservation lies in the efficient insulation of heated and cooled surfaces against unnecessary loss. In treating this branch of the subject the authors have endeavoured to collate some existing data and to present a certain amount of new information based on recent research and experience with a view to assisting engineers, chemists, and others interested in computing the value of various insulations available, and simplifying the selection of the materials most suited to their particular conditions. At present magnesium carbonate and pure cork board are the most widely used non-conductors for medium and low-temperature work respectively. The production of special insulators for high temperature work is a much later development, probably as recent as 1916.

Qualities of Insulating Medium

The qualities required of a heat insulating medium are :—(1) Low heat conductivity. (2) Low specific heat. (3) Low specific gravity. (4) Mechanical strength. (5) Reasonable security against fire. (6) Absence of corrosive action (in wet or dry condition) on surfaces in contact. (7) Resistance to alternating conditions of high and low temperature, wetness and dryness. (8) Stability under the required temperature conditions, *i.e.*, no signs of disintegration or fusion. (9) For low temperature work, where humid conditions prevail, an absence of capillarity is desirable, otherwise absorption of moisture greatly impairs the insulating value.

The main things to consider in the selection of a material are the temperature range, the environment, and the greatest efficiency compatible with the lowest first cost, which is to a large extent influenced by the economic value of the units it is intended to conserve.

The guaranteed annual saving in heat by the various grades of material and thickness considered should be set against the interest upon the capital outlay. By this means also what is usually termed the economical thickness is ascertained, for a point will be reached where an additional increment of thickness will not be justified by the extra saving effected. The bulk of the saving is ensured by the primary thickness applied, subsequent increments having proportionally less effect, since the reduction of heat loss does not vary directly with thickness.

Insulating materials should not be purchased by weight unless the covering capacity is known, but rather by the unit of surface area, or lineal run, of pipe covered to a given thickness ; moreover, the lighter materials are usually the better insulators, and therefore a given weight will cover a greater surface with better effect. These considerations greatly facilitate the selection of the most suitable material.

The Protection of Insulation

Good non-conductors are, owing to their physical structure fairly fragile and liable to injury either mechanical or due to exposure in an unsuitable atmosphere. Mechanical strength and low conductivity do not generally go hand in hand. With most materials in common use it is necessary to effect a compromise between the two ; this is attained through the composition of the material, and by adequately protecting the external surface.

The most extensive application of slab cork insulation is in the cold store or refrigerating chamber. It is usually applied as an essentially waterproof cement or plaster to minimise mechanical damage during charging and discharging, and to permit of the chamber being washed out. The protective materials comprise cements of various kinds, wood, and sheet metal. The adoption of the particular type depends to some extent upon the views of the purchaser and the local conditions. Wood is generally agreed to be the least satisfactory, and is adopted principally because it is cheap.

For medium and moderately high temperature insulation there are many factors to be considered in choosing the protection for 85 per cent. magnesia and similar types of insulation. The protectors most commonly used are canvas covering (plain or painted), and a hard setting composition, about $\frac{1}{2}$ in. in thickness. On outside work the latter is frequently tarred or finished with a coat of bituminous paint. Other finishes often applied to sectional pipe insulation consist of asbestos cloth, jute canvas, rubberoid and planished steel, the last sometimes with welded joints to form a continuous casing. For the protection of the insulation on the exposed parts of boilers, steam accumulators, etc., wire netting, sheet steel about $\frac{1}{16}$ in. thick, or sheet lead are frequently used over the hard setting composition.

For protection of high-temperature insulation, in general, insulating bricks are interspaced between the furnace lining and the outside wall. The lining may only consist of a layer of refractory cement to protect the bricks against erosion, or may consist of one or more courses of firebrick. It is usual to adjust the thickness of the lining until the interface temperature is about that to which it is safe to heat the bricks. This temperature varies considerably with the different kinds of brick, and should always be ascertained from the makers, who generally manufacture various grades having different refractory values.

What may be termed the external protection may consist of common brick or steel shell, which should, as far as possible, bear the structural stresses.

In hot-blast mains and similar applications the weight factor is of great importance. Under these conditions it is advisable to employ only a thin skin of high-temperature cement to resist the erosive action of the gases and the dust contained therein.

Transmission of Heat

Dense and homogeneous substances, such as metals, transmit heat by direct conduction from particle to particle. Such physical structures facilitate heat flow. Non-conducting materials are not homogeneous, but are composed of an agglomeration of particles and air spaces, hence the transfer of heat is accomplished by direct conduction through the particles, radiation from particle to particle, and convection currents set up in the air spaces. The heat flow is thus greatly impeded. The size and number of the air spaces are points of great importance. They should be as small as possible and evenly distributed throughout the mass, since air maintained in a perfectly static condition has a very low conductivity. The static condition of the air can only be ensured by making the air pockets as small as possible. Baked slab cork has a physical structure approximating to these conditions, the number of closed air cells in 1 cub. in. being of the order of 400,000,000. Basic magnesium carbonate depends for its insulating value upon the air entrapped by the interlocking of the microscopic needle-shaped crystals. It should be noted that in 85 per cent. magnesia the asbestos fibre is used only as a binder. Diatomite, which is a constituent of many insulating materials, consists of air cells formed by the siliceous skeletons of marine animalculæ. In some forms of non-conductors the air spaces are mechanically produced by means of corrugated layers of material such as asbestos paper, and by the felting of asbestos and other fibres.

The transfer of heat from a body to the surrounding air, or *vice versa*, occurs by direct contact between the two, as well as by the radiation process. This more direct heat transfer is termed convection. When the hot body is surrounded by still air, the process of transfer is termed "natural" convection. Layers of the surrounding fluid in the immediate vicinity of the surface become heated and movement of the fluid occurs, which assists the process. The extent of the movement is influenced by the size and shape of the body and the presence,

or otherwise, of re-entrant portions. The velocity and direction of the engendered currents will be affected by the orientation of the surfaces, since the conditions of air movement will obviously be different for a heated surface facing downwards from those occurring on a surface facing upwards or in the vertical plane. The estimation therefore of the convection loss is considerably complicated in practice, where every condition of size, shape, and orientation may be encountered. Some degree of approximation therefore becomes necessary in practice. When the surfaces under consideration are not surrounded by still air all the factors become different. This condition is termed " forced " convection, since the naturally occurring air currents are replaced by a constant motion of the surrounding fluid, according to the velocity and direction of the disturbance. Under these conditions the estimation of the convection loss becomes more complicated and more difficult to apply to the practical case where all sorts of different circumstances exert an influence. The knowledge of the process of convection in still air has been largely augmented by the work of Griffiths and Davis, and extended by Fishenden and Dufton. Griffiths and Davis showed that the heat loss due to convection varied with the power 1·25 of the temperature difference between the surface and surrounding air.

Whilst the use of insulating materials for high-temperature furnaces, etc., is increasing every day, the adoption of this practice is not as general as its importance warrants. This is, no doubt, due in some measure, first, to an insufficient realisation of the extent of fuel economy which can be effected, and, secondly, to the fact that injudiciously applied insulation has in some cases resulted in the breakdown of refractory linings.

New Discoveries in Fine Chemicals

Some Patenting Difficulties

At a meeting of the Manchester Section of the Society of Chemical Industry held on Friday, March 7, an address on " Fine Chemicals," by Dr. F. L. Pyman, Director of Boots' Research Department at Nottingham, was read by Mr. Leonard Anderson, manager of the Fine Chemicals Department of Boots, Ltd., in the unavoidable absence of Dr. Pyman. Dr. R. H. Pickard presided.

Dr. Pyman said it would be clear that a manufacturer incurred considerable expense in the hope of discovering new drugs, and it seemed to him not unreasonable for him to expect a monopoly for a time for such drugs as had been discovered through his enterprise. Moreover, the fact of having a monopoly gave the manufacturer an incentive to market his product. During the war, Dakin introduced chloramine-T (sodium-*p*-toluenesulphonchloroamine) for use in the treatment of wounds. It was a valuable antiseptic with which his (Dr. Pyman's) firm had been closely associated. His and doubtless other firms were asked why they did not advertise its virtues widely. The answer was that the substance was not patented, and could be manufactured by all and sundry. Obviously, it was more profitable for a manufacturer to spend money on advertising a preparation in which he held the sole interest, rather than in increasing the sales of a compound of which he might make only a small proportion. Another difficulty in reaping the fruits of enterprise arose from the fact that the use of substances in medicine could not be patented unless the substances themselves were new.

Three Courses Open

Dr. Pyman illustrated his meaning by a hypothetical case. 1 : 8-dihydroxyanthraquinone was employed as a purgative ; natural purgatives were derived from 2-methylanthraquinone. It might well be the case that by preparing all the many dihydroxy derivatives of 2-methylanthraquinone and investigating each physiologically one might be found which proved to be efficient as a purgative and at the same time to have no toxic or other objectionable action. Patents, however, were not granted for the use of substances in medicine, consequently, if the preparation of this particular dihydroxymethyl anthraquinone happened to have been described previously, the discoverer of its purgative properties could not get any patent protection for his discovery. He would then have three courses open to him : (1) He could put his substance on the market under a registered name, " the Something " brand of dihydroxymethyl anthraquinone, when he would be speedily followed by other manufacturers putting it on as the " Something else " brand. (2) He could put it on the market in disguise as a constituent of a mixture of undeclared composition. This course might be quite suitable in the case of a dyestuff, and a dyer might be quite willing to use a " Sky Blue X.Y.Z." whose composition he did not know, but this procedure would prejudice a medicinal preparation in the eyes of medical men. (3) He could withhold his knowledge of its physiological activity and attempt to find some derivative or allied substance having similar physiological action which was new and for the preparation of which a patent could be obtained.

Divided Views

It was obvious that the first course deprived the discoverer of any monopoly in his invention, whilst the second and third prevented his discovery from becoming open or patent. From the manufacturer's point of view, then, an adequate system of monopoly patents was an incentive to research, to marketing products and to disclosure of processes.

On the other hand, many members of the medical profession felt that patents for medicinal chemicals should not be allowed. Medical ethics prevented the patenting of drugs by registered medical practitioners, and this fact undoubtedly raised difficulties where a discovery had been made by a team of research workers which included a medical man. A proposal had been made recently to attempt a compromise between the interests of the manufacturer on the one hand and the view of many members of the medical profession on the other. It had been proposed that monopoly patents for medicines should not be granted to individuals or companies, but that " in the case of inventions subserving medical purposes no application for a patent should be accepted except on the condition that it should be dedicated to the British public." Such dedicated patents would be vested in the hands of a Medical Patents Trustee, who would be empowered to issue licences for their use, the discoverer having a prior right to nominate a manufacturer in the United Kingdom and retaining the foreign rights in his discovery.

That scheme might prove to be of considerable value in facilitating the patenting of inventions of the " biological type," for it would provide medical research workers with a means of protecting their discoveries for the benefit of the nation without infringing their ethical code, but he was not at all sure that it was desirable in respect of " chemical inventions " of drugs. Some possible national benefit might result from the suggestion if it led the Medical Research Council to insist that important inventions subsidised by public money (*e.g.*, by grants) should be protected and the patents vested in the nation.

An Opening for Foreigners

At present it was left to the discretion of researchers, subsidised by national funds, to decide whether they should patent their inventions or not. Thus, Cohen and his associates, working on behalf of the Medical Research Council, had prepared a long series of anils and styryls by condensing quinaldines with derivatives of aniline or benzaldehyde, and the antiseptic value of these had been determined by Browning, also subsidised by the British Government. The most efficient of this series of compounds was a preparation from a condensation product of 2 : 6-dimethylquinoline methochloride with *p*-nitrosodimethylaniline, and after a thorough clinical trial, at Leeds University, had been marketed by two British firms under the name given to it by the inventor, " Quinanil " (Armitage, Gordon, Cohen and Ellingworth, *Lancet*, 1929, 968). This substance was not patented by the discoverers, and it was open to foreign manufacturers to prepare it and undersell manufacturers in this country. There was yet a further danger to national trade in medicinal chemicals, which might be exemplified by the case of thyroxin.

The brilliant work of Harington and Barger (*Biochem. J.*, 1927, **21**, 169) had recently led to the determination of the constitution and the synthesis of thyroxin. The synthesis of thyroxin was carried out by a novel method and might

very well have been patented, but was not. It therefore became available for the use not only of British but also of foreign manufacturers. A Swiss firm had recently taken out a British Patent (No. 318,582) for effecting the conversion of Harington and Barger's azlactone into diiodothyronin in one operation instead of two, and whilst the particular advantage to be gained in this case might not be of much importance, it illustrated the folly from a national point of view of failing to protect a really original discovery in the national interest and permitting the foreigner to acquire a monopoly in an improvement in the invention. Had Cohen been able to patent the preparation of "Quinanil" and Harington and Barger the synthesis of thyroxin in the national interests rather than in their own they might have been willing to do so and, in such cases, dedicatory patents might serve a useful purpose.

Dr. Pyman also dealt with the fact that if a manufacturer was not allowed to obtain the fruits of his enterprise in sinking money in industrial research in his own interests he would endeavour to keep his processes secret rather than to broadcast them.

The Formation and Growth of Crystals

An Interesting Paper and Discussion

"The Formation and Growth of Crystals" was the title of a paper read by Professor W. E. Gibbs at a meeting of the Institution of Chemical Engineers in London on Wednesday, March 5. The President (Mr. J. Arthur Reavell) was in the chair, and an interesting discussion followed.

THE first condition essential to the formation of a crystal from any molecular disperse system, whether a pure liquid or vapour or a saturated solution, is the supersaturation of the system with respect to the component that is to crystallise out. In practice, said Dr. Gibbs, the requisite degree of supersaturation is brought about either by cooling a hot, saturated solution or a fused material, or evaporating the solvent from a saturated solution.

Importance of Agitation

To obtain well-formed crystals from suitable solutions, it is of first importance to maintain an adequate supply of seed crystals at every point. The success of many large-scale crystallising processes depends upon well-designed agitation. Frequently a type or degree of agitation which is suitable at an early stage of the process is quite inadequate when the solution has become thick with fine crystals. Flocculation and secondary growths set in, and an irregular product is obtained. For such solutions a suitable vessel might be designed somewhat on the lines of a Dorr classifier. For strongly crystallising substances—for example, $Na_2S_2O_3$, KCl, alum—continuous operation and controlled growth are successfully obtained in a crystalliser of the Swenson-Walker or Wulff and Bock type.

When, from a saturated solution, some of the solvent is removed by evaporation the residual solution becomes supersaturated. Actually supersaturation occurs only at the free surface of the liquid where the solvent becomes vapour. At the heating surface the liquor is superheated, but, owing to the increased pressure upon it, due to the hydraulic head of liquid above it, no vapour actually forms. These conditions are obtained when a saturated solution is boiled in a salting-type vacuum pan with vertical tubes, for the working level of the solution is above the top tube plate. They occur also in shallow open pans when the working temperature is well below boiling-point and in deep open pans at boiling-point when there is good forced circulation.

Spontaneous Formation of Nuclei

The removal of so much solvent from the boiling surface layer in a vacuum pan—even from a deeply agitated surface layer—produces, locally, a sufficient degree of supersaturation to lead to the spontaneous formation of nuclei. These nuclei, travelling along with the circulating liquor, put on weight so long as the liquor in which they are travelling is supersaturated. The longer their path the greater the final crystal will be. Unfortunately for the growth of large crystals in a vacuum pan, the degree of supersaturation produced at the evaporating surface is so great that heavy nucleation occurs and a very large number of small crystals are the result. To a slight extent the size of the pan affects the grain size of the product. When salt brine, for example, is evaporated at a given rate in different evaporators the salt crystals may vary in size from 100-mesh to 20-mesh, according to the size of pan used.

We may assume that the supersaturation of the surface layer follows immediately upon the removal of solvent. There is, however, a definite time interval between the supersaturation of the solution and the formation of crystals. If the degree of supersaturation is too small to cause spontaneous nucleation and other nuclei are not already present, no crystals will form. To obtain controlled crystallisation in an evaporator, therefore, it is necessary to work at a low rate of evaporation from a quiescent surface, and circulate the supersaturated solution through a bed of previously formed crystals.

The Discussion

The President (Mr. J. Arthur Reavell) said the control of shape and size of crystals was becoming more and more important because buyers now demanded not merely crystals but crystals of a certain shape and size. Another direction in which work was required to be done was in the matter of dual solutions. He himself had done an enormous amount of work years ago on the crystallising out of galiciate liquors in connection with the nitrate fields of Chile. More than £20,000 was spent by some friends of his on that one subject alone, and it was possible to get the nitrate of soda and the calcium chloride and salt out in separate evaporators and get a very efficient process in that way.

The Behaviour of Powders

Dr. Geoffrey Martin said it was not generally known that most of the phenomena with which Professor Gibbs dealt was simulated by particles of a vastly larger order of magnitude, namely, particles belonging to dry powders produced by grinding in ball or tube mills. If such a powder was fractionated by air streams of different speeds and thus sorted out into various homogeneous grades, it would be found that in many cases the phenomena presented by molecular aggregates were closely simulated by such powders, which might be regarded as composed of individual dust particles corresponding to the individual molecules of liquids and gases. In other words, we might look upon a liquid as a powder whose particles were of molecular dimensions. It was known that such powders behaved in many ways like liquids running through pipes. Again, the phenomenon of evaporation and boiling common to all homogeneous liquids was simulated by homogeneous powders. What might be termed by analogy "Crystallisation" also occurred in such powders. "Aerated" coal dust ran like a fluid and behaved like a quicksand and could easily be wormed through screw conveyors to the fuel burners—sometimes even flowing too fast, so that a tank would empty itself in a very disconcerting manner. However, if allowed to stand for some time, especially if not absolutely dry, it settled out into a mass of material which acted just like a solid body—no longer flowing freely but blocking up the fuel tanks and feeding worms. The difference in the properties of coal dust in these two states was most remarkable and must be experienced to be believed. He believed the cause lay in the different orientation of the particles. Another example, which was familiar to all practical cement men, of what we might term for want of a better name the "Crystallisation" of powders occurred in old-fashioned cement works in the cement grinding and storing sheds. Here the dust escaping from the grinding operation floated upwards and escaped from the top of the sheds in the form of a fine powder or smoke. In the course of time the roofs and surrounding walls were covered to a depth of an inch or more with this dust. If this deposit was examined, it would almost invariably be found that the dust was not uniformly deposited, but that the dust particles had aggregated together into a curious foliage-like structure, which closely resembled a crystalline growth.

Another very curious case of the aggregation together of dust to form crystal-like agglomerates occurred in the case of some experiments he had carried out recently for the British Portland Cement Research Association. A new type of cement kiln was being tested, the peculiarity of which was that the raw material was introduced in the form of a dry dust and fell into an enormous red-hot chamber in which a cyclonic action was going on. The smaller particles formed first and adhered to the larger ones, and it was found that the dust particles in the course of a fraction of a second aggregated together in the upper part of the kiln and fell out at the bottom of the kiln often in pieces ranging from say ½ inch to 6 inches and more in diameter. These remarks would, he hoped, direct Professor Gibbs's attention to a subject which teemed with interest and which was the direct analogue of crystalline growth on a much larger scale.

Mr. W. H. Dearden said that the correct explanation of the crystallisation of a metal or alloy was something that still escaped us notwithstanding the enormous amount of scientific work that had been done and was being done on this subject.

New President of Institute of Metals

Dr. Seligman's Address

AT the annual meeting of the Institute of Metals, held in London on Wednesday, Dr. R. Seligman, the new president, was inducted to the chair by the retiring president, Dr. Rosenhain.

In his presidential address, Dr. Seligman said that a scheme was on foot to erect on some suitable site a great building devoted almost exclusively to the housing of a number of learned societies, of which the Institute was one. He confessed to having been but a very lukewarm supporter of the movement, but recently the scheme had undergone modification, and if carried through on the lines now proposed, hesitation would be completely swept away. By enlarging the scope of their plans, the promoters hoped that not only would there be no financial burden imposed on the participating societies, but that they would economise in various important directions, so that money would be set free for other purposes. Of its many advantages there could be little doubt. Not least of these would be the enhanced prestige, not of the Institute or of any society alone, but of the whole body of scientific societies.

DR. R. SELIGMAN

When he looked back over the thirty years which had passed since he left the University to take up industrial work, it seemed that his whole working life had been devoted to the one object of transmitting the lessons learned from the distinguished scientists who were his teachers to a number of industries in which scientific methods of thinking and working had until recently made but little headway. New obligations were imposed by the fact, gratifying in the highest degree, that the Institute, in the short space of twenty years, had developed from a small body of English enthusiasts into an international institution, with a membership spread all over the civilised world. Their objective in the future would no longer be confined to the dissemination of non-ferrous metallurgical doctrine, but would include the creation of a solid body of such metallurgical opinion throughout the world. The conference now taking place under the chairmanship of the immediate past-president had the co-ordination of research in various countries for its object. This movement was initiated by Dr. Rosenhain at a dinner given in their honour by the Deutsche Gesellschaft für Metallkunde at Düsseldorf, and received an immediate and hearty welcome from the metallurgists of many nations there assembled. For the present the movement was designed to provide means for keeping those engaged on non-ferrous research in the various countries informed as to what was going on in other countries, and so to prevent unnecessary overlapping and the irritation sometimes caused when work done in one country was apparently ignored by the scientists of another. Such a movement seemed to be full of promise, provided only that its authors recognised the limitations which the conditions of the day imposed upon it. They must recognise that with the organisation of industry as it was emerging from the regrouping and reconstitution now in progress, there were arising research bodies attached to the great combines, which were themselves doing a great deal of the work—even fundamental research—which heretofore had been within the special field of individuals and the universities. With the best will in the world such bodies would, in many cases, be prevented from communicating their plans to others. It would often be quite enough for an astute commercial rival to know that a certain laboratory was proposing to work on a subject, to make him realise that in that direction some great technical prize was awaiting him, and for reasons such as this it would be thought necessary to keep plans secret as long as possible. If this and similar limitations of the moment were recognised from the start, they could confidently look for great benefits from Dr. Rosenhain's committee.

Career of the New President

Dr. Richard Seligman was born in London in 1878, educated first at Harrow, and later at the Central Technical College City and Guilds Institute, under Professor Armstrong, being awarded the associateship in 1898. He studied chemistry at the University of Heidelberg, and transferred to Zürich in 1900, being engaged in research work with Professor Eugen Bamberger. Returning to Heidelberg he gained his doctorate (Ph.nat.D.) in 1902. After a period in the Niagara Research Laboratories, U.S.A., he became chief chemist to the United States Zinc Co. of Pueblo, Colorado. In 1905 he began the specialisation in his main work with his appointment as chief chemist to the British Aluminium Co., which appointment he relinquished in 1909 to form the Aluminium Plant and Vessel Co., Ltd., Wandsworth, London. The activities of this concern have been devoted to the development of aluminium in the service of industry, originally in the welding processes which enabled large scale plant to be devised, and latterly in the associated technological work involved in its use in the foodstuffs, chemical, and other industries.

Lord Rayleigh's Loss

Laboratory Destroyed by Fire

VALUABLE scientific instruments, including some which had belonged to his father, were destroyed in a fire at the laboratory of Lord Rayleigh at Terling, Essex, on Thursday night, February 28. Fortunately his papers and records, representing a great deal of scientific research, were saved. Lord Rayleigh, who was in London at the time, was informed of the outbreak by telephone and when he arrived on the scene most of the damage had been done. His laboratory and workshop, he stated later, had been completely burned out. It would be possible to replace most of the instruments, but the fire would entail a great waste of time in research work. The laboratory would be refitted before the autumn and it would be a costly matter. The material damage is estimated at several thousand pounds.

B.S. Specification for Vandyke Brown

A REVISED edition of B.S. Specification No. 319–1928 Vandyke Brown for Paints, has just been issued by the British Engineering Standards Association. After two years' experience in the use of this specification it was found that certain clauses needed modification in some small particulars, notably those clauses dealing with ash and volatile matter. The form of the specification follows that adopted in the previous issue, clauses regulating the composition, together with standard reception tests for the purchase of the material, being included, also appendices dealing with the standard methods for carrying out the tests. Copies of this specification may be obtained from the British Engineering Standards Association, Publications Department, 28, Victoria Street, London, S.W.1, price 2s. 2d., post free.

British Chemical Overseas Trade for February

Lower Imports, Increased Exports

CHEMICALS provide one of the redeeming features in the Board of Trade returns of overseas trade for February, showing an increase in exports and decreased imports as against a substantial drop in both sections for the total trade of the country.

Imports of chemicals, drugs, dyes and colours were £1,069,511, a decrease of £80,129 compared with the corresponding month of last year, exports £2,014,947, an increase of £78,930 and re-exports £54,798, a drop of £3,189.

Imports

	Quantities Month ended February 28,		Value Month ended February 28,	
	1929.	1930.	1929.	1930.
			£	£
CHEMICAL MANUFACTURES AND PRODUCTS—				
Acetic Anhydride .cwt	1,420	40	56,161	168
Acid Acetic .....tons.		1,075		39,930
Acid Tartaric ....cwts.	2,693	2,034	18,187	13,677
Bleaching Materials ,,	11,267	8,582	11,381	5,316
Borax..... ,,	5,467	21,440	3,802	14,186
Calcium Carbide... ,,	57,052	82,897	35,209	47,044
Coal Tar Products not elsewhere specified value	—	—	1,229	1,956
Glycerine, Crude..cwt.	462	1,360	923	2,378
Glycerine, Distilled ,,	840	1,386	2,178	3,189
Red Lead and Orange Lead .....cwt.	3,232	4,090	4,606	6,561
Nickel Oxide..... ,,	—	—	—	—
Potassium Nitrate (saltpetre) .....cwt.	10,453	8,153	10,508	7,951
Other Potassium Compounds .....cwt.	290,309	256,800	76,666	63,580
Sodium Nitrate ... ,,	280,030	180,220	139,945	81,755
Other Sodium Compounds .....cwt.	26,662	24,162	19,622	14,828
Tartar, Cream of . ,,	3,457	2,188	16,382	10,447
Zinc Oxide .....tons	896	782	25,752	22,907
Other Sorts .....value	—	—	246,064	199,628
DRUGS, MEDICINES, ETC.—				
Quinine and Quinine Salts .....oz.	91,155	79,407	7,108	6,198
Bark Cinchona (bark Peruvian, etc.).. cwt.	887	1,009	3,479	4,303
Other Sorts .....value	—	—	180,803	152,621
DYES AND DYESTUFFS—				
Intermediate Coal Tar Products .....cwt.	62	67	970	999
Alizarine ..... ,,	154	138	5,122	8,280
Indigo, Synthetic.. ,,	—	—	—	—
Other Sorts..... ,,	3,339	4,826	72,527	100,067
Cutch..... ,,	3,255	3,704	4,703	6,133
Other Dyeing Extracts cwt.	2,922	1,955	8,315	6,385
Indigo, Natural.... ,,	31	30	711	799
Extracts for Tanning ,,	51,361	92,237	52,046	91,830
PAINTERS' COLOURS AND MATERIALS—				
Barytes, Ground...cwt.	36,412	39,365	7,453	8,095
White Lead (dry).. ,,	12,150	14,282	20,183	25,410
All Other Sorts.... ,,	87,771	100,824	117,005	122,890
Total of Chemicals, Drugs, Dyes and Colours, Class III, Group N ....value	—	—	1,149,640	1,069,511

Exports

CHEMICAL MANUFACTURES AND PRODUCTS—				
Acid Sulphuric ....cwt.	2,084	19,202	2,744	4,913
Acid Tartaric .... ,,	1,078	1,156	8,050	8,056
Ammonium Chloride (Muriate) .....tons	459	256	8,214	5,761
Ammonium Sulphate—				
To Spain and Canaries tons	8,598	17,728	86,258	149,853
,, Italy..... ,,	201	735	1,900	7,569
,, Dutch East Indies tons	2,549	5,405	26,757	48,704
,, China (including Hong Kong tons	5,335	5,370	56,009	48,577
,, Japan..... ,,	12,270	11,354	126,699	98,334
,, British West India Islands and British Guiana tons	631	549	6,425	4,675
,, Other countries ,,	7,591	10,949	75,715	92,738
Total ..... ,,	37,181	52,090	379,763	450,450
Bleaching Powder ...cwt.	52,689	62,512	14,648	17,527

	Quantities Month ended February 28,		Value Month ended February 28,	
	1929.	1930.	1929.	1930.
			£	£
COAL TAR PRODUCTS—				
Anthracene .....cwt.	—	—	—	—
Benzol and Toluol..galls.	904,127	32,435	67,741	4,467
Carbolic Acid ....,cwt.	18,294	3,419	29,651	7,234
Cresylic Acid .....galls.		128,240		14,907
Naphtha ..... ,,	4,743	8,907	454	910
Naphthalene (excluding Naphthalene Oil) cwt.	6,602	12,005	2,971	3,914
Tar Oil, Creosote Oil, etc. galls.	66,502	3,841,964	4,039	90,566
Other Sorts .....cwt.	9,530	27,472	8,276	15,518
Total .....value	—	—	113,132	137,516
Copper, Sulphate of..tons	5,779	3,451	137,373	81,525
Disinfectants, Insecticides, etc. .....cwt.	28,710	28,403	69,690	65,073
Glycerine, Crude..... ,,	11,486	542	14,620	766
Glycerine, Distilled .. ,,	7,714	11,792	25,110	30,739
Total ..... ,,	19,200	12,334	39,730	31,505
POTASSIUM COMPOUNDS—				
Chromate and Bi-chromate .....cwt.	1,101	1,062	2,207	2,106
Nitrate (Saltpetre) ,,	998	1,163	1,877	2,172
All Other Compounds ,,	2,957	1,694	10,939	9,248
Total ..... ,,	5,056	3,919	15,023	13,526
SODIUM COMPOUNDS—				
Carbonate cwt.	344,256	472,601	100,348	121,730
Caustic..... ,,	145,123	167,517	95,241	107,564
Chromate and Bi-chromate .....cwt.	3,641	2,524	5,641	4,082
Sulphate, including Salt Cake .....cwt.	64,012	40,743	7,439	5,542
All Other Compounds ,,	48,339	55,303	47,214	59,620
Total ..... ,,	605,371	738,688	255,883	298,538
Zinc Oxide.....tons	177	184	5,807	5,884
Chemical Manufactures,etc. all other Sorts..value	—	—	247,525	277,724
Total of Chemical Manufactures and Products (other than drugs and dyestuffs)..value	—	—	1,297,582	1,398,598
DRUGS, MEDICINES, ETC.—				
Quinine and Quinine Salts .....oz.	151,540	134,034	13,045	13,177
All other Sorts....value	—	—	225,485	225,943
Total ..... ,,	—	—	238,530	239,120
DYES AND DYESTUFFS—				
Products of Coal Tar cwt.	13,297	8,780	75,834	65,195
Other Sorts ..... ,,	4,799	8,764	6,141	10,564
Total ..... ,,	18,096	17,544	81,975	75,759
PAINTERS' COLOURS AND MATERIALS—				
Barytes, Ground ..cwt.	1,282	1,080	533	514
White Lead (dry).. ,,	2,821	2,902	5,810	5,882
Paints and Colours in Paste Form ....cwt.	40,927	37,218	79,482	70,842
Paints and Enamels Prepared .....cwt.	46,062	42,394	139,716	140,080
All other Sorts.... ,,	49,530	44,667	92,389	84,152
Total ..... ,,	140,662	128,261	317,930	301,470
Total of Chemicals, Drugs, Dyes and Colours ...value	—	—	1,930,017	2,014,947

Re-Exports

	Quantities Month ended February 28,		Value Month ended February 28,	
CHMEICAL MANUFACTURES AND PRODUCTS—	1929.	1930.	1929.	1930.
			£	£
Acid Tartaric.....cwt.	115	50	960	376
Borax..... ,,	—	—	—	—
Coal Tar Products value	—	—	36	5
Potassium Nitrate (saltpetre).....cwt.	69	44	103	57
Sodium Nitrate.... ,,	390	380	239	186
Tartar, Cream of.. ,,	481	315	2,354	1,556
All other Sorts....value	—	—	14,211	11,176
DRUGS, MEDICINES, ETC.—				
Quinine and Quinine Salts .....oz.	34,244	12,188	3,452	1,466
Bark Cinchona, etc. cwt.	38	17	176	97
All other Sorts....value	—	—	28,247	30,232
DYES AND DYESTUFFS—				
Cutch .....cwt.	938	1,540	1,419	2,430
All other Sorts.... ,,	47	49	815	268
Indigo, Natural.... ,,	3	—	70	—
Extracts for Tanning ,,	741	741	897	1,060
PAINTERS' COLOURS AND MATERIALS..... cwt.	6,891	1,695	4,970	5,811
Total of Chemicals, Drugs, Dyes and Colours ....cwt.	—	—	57,987	54,798

Society of Glass Technology

Papers at Sheffield Meeting

THREE papers of considerable chemical interest were presented at an ordinary general meeting of the Society of Glass Technology held in Sheffield. "The Ternary System K_2O-CaO-SiO_2," by G. W. Morey, F. C. Kracek, and N. L. Bowen (a communication from the Geophysical Laboratory, Washington, D.C., U.S.A.), was one of a series of papers dealing with various combinations of rock-forming ingredients, in each of which one or more of the alkali oxides was present. The compositions studied gave in detail the melting relations in that portion of the ternary system from potassium metasilicate, K_2O . SiO_2, to potassium calcium orthosilicate, K_2O . CaO . SiO_2, to wollastonite, CaO . SiO_2 . and all more siliceous mixtures.

In a "Note on the Determination of Boric Oxide in Glass," Miss Violet Dimbleby, M.Sc. (Department of Glass Technology, The University, Sheffield) explained that the method of E. T. Wherry, and the modified procedure suggested by E. C. Sullivan and W. C. Taylor, previously investigated some years ago in the Department, by J. D. Cauwood and T. E. Wilson, had yielded satisfactory results in the Department and had been applied frequently to glasses differing widely in composition. Independent workers, however, had found considerable difficulties. Accordingly, the method was well discussed with several analysts, and a further series of tests was undertaken at Sheffield, to discover the points at which errors could creep into the work, and their likely magnitude.

A discussion followed the reading of this paper, the members taking part being Professor W. E. S. Turner (Sheffield), Messrs. F. W. Adams (Greenford), A. J. Somer (London), F. Winks (Sheffield), B. P. Ludding (London), F. G. Clark (Rotherham).

"The Thermal Expansion of Glasses of Three or more Constituents," by Professor W. E. S. Turner and F. Winks, M.Sc.Tech., demonstrated that the expansion curves conformed to one of four types, namely, glasses whose expansion curves showed four, three, two or one change point, over the temperature interval 0° to the critical temperature of the glasses. The types of glass showing three and two breaks in the expansion curves were given and briefly discussed. A more detailed examination was given of the glasses showing straight line relationship from 0° to the critical temperature, and it was considered that whilst the curve of the boric oxide silica glasses of this group could be explained by the non-existence of compound formation, such a condition was difficult to accept in regard to soda-silica glasses and potash lead oxide glasses, which gave similar types of curves.

Owing to lack of time, another paper on the agenda, "A Study of the Chemical Reactions in the Melting of Potassium-Borosilicate Glass," by M. A. Besborodov and Z. M. Silberfarb, was taken as read.

An Anticipatory Poetic Allegory of Research

By "Meredithian"

NOT the least of Dr. E. F. Armstrong's achievements in painting his flowery *Signposts*, which have brightened the Orange elegance of these Bitters so pleasantly, is the introduction of a writer new to chemical circles. Meredith, we imagine, even the *Egoist*, is not normally placed upon their shelves. It is to be expected that Mr. Tizard will now recommend him both to the Staff and to the Constituency of the body which laments his recent loss—the D.S.I.R.—and to the students whose literary souls are to-day his obvious care. South Kensington, in future, may well be made the Shaving ground of innumerable Shagpats where many *Identicals* will be visioned and shorn, when the proper interpretation is given to the wondrous story. Lafcadio Hearn, in his *Interpretations of Literature*, has ventured the assertion that the *Sword of Aklis* is the Sword of Science. The story is an obvious allegory, maybe an unconscious cerebration of our science, however much Meredith may have conceived it as a mere exercise of Eastern fancy. Impervious to naturalistic thought as is the literary mind, there must be aberrants showing intelligence at times. Meredith was certainly a nature lover. Whatever it be, it is a literary classic of great beauty to be put alongside the two *Alices*. It was written with duns at the door. The chapter from which Dr. Armstrong takes his first quotation, describing the punishment of one *Khipil*, is clearly a satire, in advance, upon present-day academic research in pursuit of the Ph.D. *Khipil* is a builder, commissioned by King *Shahpesh* to build him a palace, a romantic who pretends and fails to put the foreshadowed design into execution. One day he is visited by the King, who finds nothing doing or done. The story is not to be anticipated by a reviewer, beyond saying that *Khipil* is held to his professions by the king, who assumes, as he inspects the site, that his orders have been executed and the buildings there. Three days and three nights *Khipil* is kept gasping without water, compelled to drink of the drought of the fountain which he has failed to erect. A vision of him of whom *Bhanavar* prophetically spoke as

> "Treble-tongue and throat of glue."

Wilder, D.B. and his many vain professions of water. at once appears before our eyes. Seven days and seven nights the pretender is made to stand with stretched arms, as they were the branches of a tree, in each hand a pomegranate. The likeness to Arrhenius holding out the promised ions is unmistakable. In this way, one by one are verified *Khipil's* various undertakings. We can fancy members of the physical fraternity, led round with their books, forced to face the many unfulfilled assertions they have made, going "draggingly,"

> "Knowing a dreadful strength behind
> And a dark fate before."

It had been the fashion, we read, to do as did *Khipil*, and fancy the tongue a constructor rather than a commentator. (Is not this perhaps an adumbration of a certain physical journal?) After his punishment, there were few in the dominions of *Shahpesh* who sought to win the honours bestowed by him on gabblers and idlers. The moral is stated in poetic terms very clearly:

> "When to loquacious fools with patience rare
> I listen, I have thought of Khipil's chair:
> His bath, his nosegay and his fount I see—
> Himself stretched out as a pomegranate-tree.
> And that I am not Shahpesh I regret,
> So to enmesh the babbler in his net.
> Well is that wisdom worthy to be sung,
> Which raised the Palace of the Wagging Tongue."

One such Palace at least is "somewhere in Piccadilly," its organ various Transactions and Proceedings. Some day the spirit may move us to deal with its frequenters as did *Shahpesh*, so that our shelves may be less laden.

Coal Cleaning Problems

Recent British Developments

A PAPER on "Some Developments and Problems in Coal Cleaning," by F. S. Sinnatt and D. T. Davies, was presented by the authors and discussed at a joint meeting of the Society of Chemical Industry and the Institute of Fuel held at the Chemical Department, Bristol University, on Thursday, March 6.

The subject, it was stated, is of special interest at the present time because very rapid advances have been made during the past seven years, and particularly during 1927 and 1928, and the view held in some quarters that Great Britain has lagged behind the Continent in the application of methods of coal cleaning is incorrect.

Greater application of methods of coal cleaning has been brought about because the proportions of the types of coal required by industrial concerns are changing. Modern developments in the utilisation of coke and coal for many purposes, and the great interest taken by the general public in the coal industry has introduced a change of opinion on commercial grades of coal. It is no longer thought desirable to offer for sale uncleaned coal, especially of small sizes, because industry can utilise it, but rather to provide the cleanest coal it is possible to obtain from each particular seam.

Work of Fuel Research Station

The paper contained observations upon some of the developments of recent years, and restated certain problems on the more fundamental aspects of coal cleaning with suggestions based upon information gained in the course of work carried out in the experimental washery at the Fuel Research Station. Reference was made to the Lessing process which is the application on a large scale of the principle of the float-and-sink test widely used in the examination of coal. An important feature of Dr. Lessing's technique consists of the most efficient removal of the dust before the coal is subjected to treatment in the actual gravity separation plant.

During the past few years, Messrs. Norton's, of Tividale, have elaborated a method of automatically controlling the depth of the bed of dirt in jig washers, and the method was subjected to exhaustive experiments upon the British Baum at the Fuel Research Station, and the plant more than fulfilled the claims of the makers. Fine coal can be used in furnaces in the pulverised form, but authorities are beginning to doubt the efficiency of using dirty coal for pulverised fuel firing, and in populous districts special objections have been raised. Recently there has occurred an increase in the practice of removing fines, generally by air blast de-duster, before washing coal in order to eliminate or minimise the slurry problem. Where de-dusting is practised, the main advantage obtained is that the slack is more easily dewatered, since the fines clog the interspaces, and cover the surfaces of the coal with a slime of fusain and clay.

Ultra Clean Coal

Increasing interest is being taken in what may be termed ultra clean coal, and areas in which pure coal seams occur, are gaining a certain advantage. Coal is at present being sold containing only 1·2 to 1·5 per cent. of ash. If the demand for such special products increases it should be possible, in the opinion of the authors, to obtain such coal not from special seams, but from many average seams, by the manipulation of ordinary washers, the Lessing method, or by working other washer systems, so that three products—viz., dirt, commercially clean coal and ultra clean coal—are recovered from the raw coal.

The authors state that it would appear that the ankerites which contain carbonates of calcium, magnesium and iron favour the retention of sulphur in the clinker or ash, which suggests that one method of preventing the emission of a proportion of the sulphur dioxide is either to retain the ankerites in the coal or to add chalk, magnesite, etc., to the commercial grades. Obviously the lower the sulphur the less contamination of the atmosphere when the coal is burned for power purposes, and consequently the less the objection from inhabitants of the surrounding neighbourhood.

Some consideration must be given to the amount of chlorine in coal before deciding upon the system of cleaning to be adopted. In the past the question of chlorine has been of particular interest to those engaged in the manufacture of coke, but coal suitable for steam raising not infrequently contains fairly large percentages of chlorine. Chlorine occurs combined with the organic substance of coal and as chlorides of sodium and magnesium, etc. The amount present may vary from one locality to another in the same seam, and in one particular instance a seam was found to contain from less than 0·1 per cent. of sodium chloride at one place to over 1·0 per cent. in a neighbouring locality. Knowledge of the rôle played by chlorine during the combustion of the coal in furnaces is incomplete, but since in certain cases it may be highly desirable to reduce the amount of chlorine in the cleaned grades, it is obvious that dry cleaning methods are not so suitable as wet. The only practical method of removing the salt from coal is by solution in water.

The Question of Smoke Prevention

Cyclone Type of Separator Commended

AT a meeting of the Institute of Fuel held in the Chemical Society's Rooms, London, on Wednesday, Professor W. E. Gibbs, in a paper, dealt with some factors affecting the problem of smoke prevention. Dr. Lander presided.

The paper was concerned particularly with the turbid flue gases that result from the combustion of coal. The author stated that smoke may be defined as a disperse system in which a solid is dispersed in an extremely finely divided condition in a gas, and pointed out that industrial smoke generally contains particles varying in size. These particles are all very much denser than the gas in which they are suspended, and therefore tend to settle from the gas by gravitation. Settling is retarded by the viscosity of the gas, which increases with rising temperature. The gas itself is generally in turbulent motion along a horizontal or vertical duct of large dimensions, and it is unlikely that under such conditions, any but very coarse particles will be removed by settling. It is necessary therefore, to devise special arrangements for catching and removing the particles. These devices operate with a limited efficiency, so that a considerable portion of the suspended material escapes into the atmosphere.

The author dealt at length with the character and formation of smoke under the headings of condensation processes; dispersion processes; coal smoke; concentration of coal smoke, etc. Tables are given showing the percentages of particles of given size in gases with powdered fuel firing, and with various fuels when using chain grate stokers, and it was shown that smoke consists of a relatively small number of widely scattered, large particles, surrounded by a host of smaller particles, the number of which increases rapidly as their size diminishes, but otherwise is proportional to their concentration. The larger particles may be removed by settling or centrifugal force, but they do not appear to carry any large proportion of the smaller particles with them.

The problem of smoke prevention is largely bound up with the problem of bringing about the flocculation of these very fine particles to form larger aggregates which can be removed along with the large particles. Gravity separation, precipitation by centrifugal force, smoke washing, flocculation, electrostatic precipitation, were all referred to, but the author's conclusion was that the cyclone type of separator provided the most satisfactory method of removing finely divided solid matter from large volumes of smoke. At present the efficiency of a cyclone separator was limited, because so much of the solid matter was too finely divided to be precipitated by this means. It was, however, conceivable that, by investigating the properties of coal smoke, it might be possible to devise simple methods for flocculating the finer particles, so that a much greater proportion of the solid matter might then be removed by centrifugal separation.

Catalytic Reactions at High Pressures

A MEETING of the Royal Society for the discussion of this subject will take place on Thursday next, March 20, at 4.30. The discussion will be opened with a short review by Professor G. T. Morgan, and it is expected that the following will take part: Mr. M. P. Applebey, Professor W. A. Bone, Professor H. B. Dixon, Professor F. G. Donnan, Dr. F. A. Freeth, Mr. S. J. Green, Mr. C. N. Hinshelwood, Mr. E. J. Lush, Colonel Pollitt, Dr. E. K. Rideal, Dr. R. E. Slade, and Professor R. V. Wheeler.

Society of Public Analysts

New Officers for the Year

THE annual general meeting of the Society of Public Analysts was held at the Chemical Society's Rooms, Burlington House, London, on Wednesday, March 5, when the President (Mr. Edward Hinks) delivered his annual address dealing with the standardisation of analytical methods.

The following were elected as officers and council for 1930: *President:* Dr. J. T. Dunn. *Past Presidents serving on the Council:* E. Richards Bolton, A. Chaston Chapman, Bernard Dyer, Edward Hinks, P. A. Ellis Richards, G. Rudd Thompson,

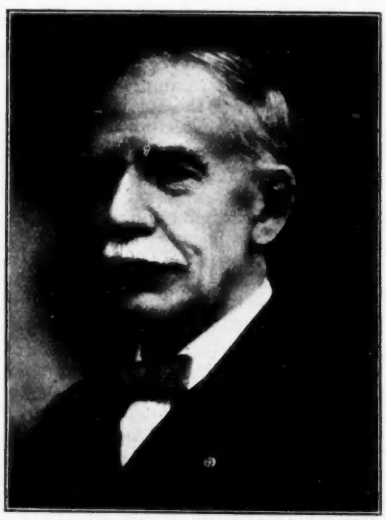


Photo by Jas. Bacon & Sons

DR. J. T. DUNN

E. W. Voelcker, and J. Augustus Voelcker. *Vice-Presidents:* J. T. Hewitt, A. More, and W. Partridge. *Hon. Treasurer:* E. B. Hughes. *Hon. Secretary:* F. W. F. Arnaud. *Members of Council:* F. H. Carr, C. H. Cribb, N. Evers, D. W. Kent-Jones, G. Roche Lynch, H. M. Mason, G. W. Monier-Williams, C. J. H. Stock, G. Stubbs, J. R. Stubbs, A. R. Tankard, and Geo. Taylor.

An ordinary meeting of the Society followed, the President, Dr. J. T. Dunn, being in the chair. Certificates were read for the first time in favour of: Charles Ambrose Adams, B.Sc., F.I.C., Janet Warden Brown, Ph.D., A.I.C., D.I.C., and John Alexander Reddie, F.I.C. Certificates were read for the second time in favour of: Leslie Mansfield Adams, James Charles Harral, Donald Frank Harrington Button, A.R.C.S., A.I.C., Hugh Childs, B.Sc., F.I.C., John William Corran, B.Sc., Ph.D., F.I.C., Archibald Orton Jones, M.A., F.I.C., James Bruce Eric Patterson, M.Sc., A.I.C., Frank James Smith, B.Sc., A.I.C., and Alfred Tingle, B.Sc., Ph.D. The following were elected members: Ronald Gilbert Baskett, B.Sc., Hugh Charles Loudon Bloxam, F.I.C., Claud McClellan Bottomley, B.Sc., John Butler, B.Sc., F.I.C., Robert Ellison, A.M.C.T., George Noel Grinling, F.I.C., Albert Houlbrooke, M.Sc., A.I.C., Philip Henry Jones, F.I.C., Raymond Mallinder, Sydney Norman Herbert Stothart, B.Sc., Ph.D., A.I.C., and Hubert Threadgold, B.Sc., A.I.C.

Abstracts of Papers

In a paper on "The Spectroscopic Investigation of Jams," Dr. S. Judd Lewis described a special form of sector photometer which he had devised, and showed how the spectroscope and spectrophotometer might be found of service in the investigation of jams. For this purpose an ethereal extract of the jam was used, and in the preliminary experiments it was found that the results, expressed as "absorption curves" having extinction coefficients for ordinates and wave lengths for abscissæ, were disturbed by the presence of small amounts of foreign ingredients, such as benzoic acid, salicylic acid, saccharin, certain colouring matters, etc.

A second paper on "A Simple Polarimetric Test for Sugars in Jams," by Dr. Lewis, described a modification of the method of determining the specific rotation of an aqueous extract of the jam, after inversion of the dissolved sugars. Dr. Judd Lewis also exhibited a special form of Kjeldahl distillation apparatus.

Overseas China Clay Trade

Imports, February, 1930

A RETURN showing the quantities and value of China Clay, including China stone, imported into Great Britain and Northern Ireland as registered in the month of February, 1930, is as follows:

Countries Whence Consigned.	Quantity Tons.	Value. £
Germany	11	100
U.S. America	28	180
Total	39	280

Exports, February, 1930

THE returns of exports of China Clay, including Cornish or China Stone, from Great Britain and Northern Ireland during February are:

Country of Destination	Quantity. Tons.	Value. £
Sweden	5	17
Norway	1,826	2,904
Denmark	331	1,036
Poland (including Dantzig)	15	35
Germany	3,369	7,084
Netherlands	4,573	10,592
Belgium	10,758	18,827
France	2,650	5,283
Switzerland	65	197
Spain	1,274	3,771
Italy	1,858	3,652
Greece	35	140
Egypt	3	13
China	16	85
Japan	129	550
United States of America	13,589	31,262
Mexico	121	402
Ecuador	1	5
Chile	2	10
Brazil	1	13
Irish Free State	—	2
Union of South Africa	13	43
British India	6,986	18,455
Madras	16	78
Bengal, Assam, Bihar and Orissa	200	822
Australia	25	124
Canada	31	79
Total	47,892	105,483

Chemical Matters in Parliament

Empire Sources of Radium

LIEUT.-COMMANDER KENWORTHY (House of Commons, March 6) asked the Minister of Health whether any progress has been made in obtaining supplies of radium independently of the present foreign monopoly, and especially from mines and workings within the Empire.

Mr. Greenwood stated in reply that he understood that the committee was considering the question, and the possibility of increasing the Cornish supply was also under consideration.

Gas Masks and the Navy

Replying to Mr. Ramsbotham (House of Commons, March 5), Mr. Alexander stated that the expenditure on gas masks for the fleet since 1919 has averaged rather more than £30,000 a year, and it is expected to be slightly under this figure in future years.

Prevention of River Pollution

Mr. Noel Buxton (House of Commons, March 6) announced that he is shortly sending a circular letter to the directors and managers of all the beet sugar factories, directing their attention to the measures for the prevention of pollution by beet sugar effluents which have been proved to be practicable. The letter will urge upon them the importance of taking steps to adopt appropriate measures, if they have not already done so, before the factories re-open for the next campaign.

From Week to Week

MR. E. P. BARFIELD and Mr. J. P. Coleman, of Wild-Barfield Electric Furnaces, Ltd., have left England for an extended visit to the United States.

"THE CHEMISTRY OF WAR" is the title of a lecture to be delivered by Major F. A. Freeth at the Royal United Service Institution on Wednesday next. Admiral Sir Henry Oliver will be in the chair.

A CHANGE OF VENUE is announced for the Institute of Metals annual dinner and dance, which, owing to the large number of acceptances, will be held on March 28 at the Hotel Metropole, Northumberland Avenue, London, instead of at the adjoining Hotel Victoria.

THE SOCIETY OF LEATHER TRADES CHEMISTS announces that in view of the rapid exhaustion of C.2 powder, the British Hide Powder Committee has decided that both C.2 and C.3 powders shall be official for the British Section until March 31, after which date C.3 will alone be an official powder.

FINALS in the first boxing competition of Imperial Chemical Industries Sports Association took place at the Pavilion Gardens, Buxton, on Saturday last. The Cheshire and North Wales Division and the North-eastern District tied for second place with 24 points each, Scotland being first with 30 points.

BRISTOL SECTION of the Society of Chemical Industry elected the following officers at its annual meeting last week:—Chairman, Mr. Stanley Robson; vice-chairman, Mr. F. E. Francis; hon. secretary, Mr. Arthur Marsden; hon. treasurer, Mr. D. T. H. Beaton; committee, Messrs. J. Bernard, T. Penny, F. W. Rison, and R. Robertson. The total membership is 146 and the average attendance at meetings over the whole year was 58, compared with 40 the previous year.

THE CONFERENCE of the International Superphosphate Manufacturers' Association at Cologne was attended by fifty delegates from twenty-eight countries. The main object of the conference, stated Mr. A. N. Gray, the international secretary, is to devise ways and means whereby the price of superphosphate to farmers may be cheapened. The world's annual output of superphosphate is 15,000,000 tons, of which 70 % is produced by members of the Association. The Association maintains an experimental station at Hamburg, and experience gained is to be placed at the disposal of the farmer.

FURTHER works developments are foreshadowed at Billingham, and for this purpose the Imperial Chemical Co. are negotiating with the Tees Conservancy Commissioners for the purchase of an area of foreshore. At a meeting of the Commissioners it was reported that there had been some modification of the original terms of purchase, and a further conference was to be held between the Commissioners' representatives and the managing director of the company this week. It is understood that part of the land is required for the construction of a dock to deal with the firm's export trade.

MR. ROBERT SPENCE, who was a student at Armstrong College, Newcastle, from 1922 to 1928, and was then awarded a Commonwealth Fund Fellowship which entitled him to study in America for two years, is one of the five scholars selected by the Commonwealth Fund Committee in America to continue his work there for another year. Mr. Spence, who began his education at Westoe Secondary School, South Shields, took a first-class honours degree in chemistry at Armstrong College, and subsequently carried on post-graduate research with Professor G. R. Clemo. He is at present studying physical and engineering chemistry at Princeton University.

MERSEY DOCKS AND HARBOUR BOARD have directed that, as from March 1, vessels discharging cargoes of oil or spirit at the Dingle jetties be charged 50 per cent. of the full dock tonnage rates, in lieu of the 75 per cent. now charged, the conditions remaining in all other respects as at present. Petroleum oils and residuum in bulk are to be added to the list of articles in connection with which 75 per cent. of the full dock tonnage rates on the importing vessel and 75 per cent. of the full inward dock rates and town dues on the specified articles are levied when such articles are discharged in the Board's docks at Birkenhead. Certain reduced dock rates and town dues, less 5 per cent. are to be adopted in respect of a number of other articles, including carbide of calcium and borate of lime and boracite.

AT THE MINERALOGICAL SOCIETY, on Tuesday next, Professor W. L. Bragg (Professor of Physics in the University of Manchester) is giving a lecture on "The Structure of Silicates," illustrated by models and lantern slides.

BIRMINGHAM UNIVERSITY COUNCIL announces a donation of £1,000 from the Chance Education Trust (founded by Chance Brothers and Co., Ltd., Glass Works, Smethwick), for a scholarship to be called "the Chance Scholarship."

A PAPER on "The Chemistry of Coal" by Dr. R. V. Wheeler Professor of Fuel Technology, Sheffield University, and director of the experimental stations of the Safety in Mines Research Board, was read before members of the Pharmaceutical Society of Great Britain at the Society's House, London.

PROFESSOR H. V. A. BRISCOE, who holds the chair of Inorganic and Physical Chemistry of Armstrong College, Newcastle, and who is at present acting Registrar, has been elected a member of the Council of the Institute of Chemistry. Last year Professor Briscoe served as Chairman of the local section of the Institute.

FOUR LEICESTER CONFECTIONERS were fined £3 each at Leicester Police Court on Wednesday for selling mint sweets containing an excess of sulphur dioxide. Mr. F. C. Bullock, public analyst, said the purpose of sulphur dioxide was to make the sweets transparent. Too much of the chemical would upset digestion, and when taken in excess would lead to gastric and internal trouble. A child eating two ounces of these sweets would have a full medicinal dose.

AN INQUEST was held at Leeds on Monday into the death of Thomas Wells, aged 36, a dyer's labourer, who was fatally scalded as the result of falling into a vat of boiling dye at Marsden's Mills, Holbeck, Leeds, on the previous Friday. Tom Wood, another dyer's labourer, said he saw Wells trying to recover the ends of a broken piece of cloth from the vat with a long pole. The witness then saw him slip into the vat and rushed to empty the vessel. Wells was got out in about three minutes. The jury returned a verdict of "Accidental death."

EXTENSIVE SILICA GEL experiments which have been carried out in conjunction with the Kestner Evaporator and Engineering Co., Ltd., have proved so successful that a large order has been placed with them for this material as a carrier for catalytic agent in connection with the direct contact process for the manufacture of sulphuric acid. The Kestner Evaporator and Engineering Co., Ltd., are, we understand, co-operating with Joseph Crosfield and Sons, Ltd., Warrington (one of the companies of the Unilever group) in the development of this business, and are able to supply a complete range of gels.

DESCRIBED AS A "MANUFACTURING CHEMIST," Peter Hill, aged 33, of 15, Silver Street, Lincoln, was remanded at Lincoln on Tuesday, on a charge of obtaining by false pretences the sum of £100, with intent to defraud, on January 31. The Chief Constable (Mr. W. S. Hughes) said he wished for an adjournment for seven days so that the police inquiries could be concluded and complainant's solicitor could attend court. He added that he would be pleased to hear any information from anyone in the Silver Street district who had parted with any money or who had had any dealings with this man, who during the past few weeks engaged rooms at 15, Silver Street under the name of the Pharmaceutical Products Distributing Co.

"ACCIDENTAL ASPHYXIATION by carbon monoxide gas" was the verdict at an inquest held at Fenton, Stoke-on-Trent, on Wednesday, into the deaths of two men who were gassed while cleaning a tube at the by-product works of the Stafford Coal and Iron Co., Ltd., on Monday. The blast furnace foreman said the men were cleaning a tube which it was thought was free from gas. Witness tested for gas by putting his head over the holes and smelling. He admitted he could have had birds and lamps if he had considered them necessary, and he agreed that after this experience he did think them necessary. The coroner warmly praised the conduct of Joseph Edge, a third man, who went to the assistance of his two workmates and was dragged out partially unconscious.

Obituary

MR. W. E. BICKERDIKE, F.I.C., F.C.I., one of the founders of Bowdler and Bickerdike, Eagle Chemical Works, Church, near Accrington, on February 26, aged 87.

Patent Literature

The following information is prepared from published Patent Specifications and from the Illustrated Official Journal (Patents) by permission of the Controller to H.M. Stationery Office. Printed copies of full Patent Specifications accepted may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Abstracts of Accepted Specifications

323,710. Dye Intermediates and Dyeing. O. Y. Imray, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, January 15, 1929. Addition to 313,636.

The sulphonic acid of an aromatic nitro-amino compound nitro-benzoylated in the amino group is subjected to a slight reduction, and the resulting nitro product is converted into the corresponding amino compound during or after the slight reduction. The products have an affinity for cotton and may be diazotised on the fibre and developed with components. In an example, the condensation product from aniline-2-sulphonic acid and 4-nitrobenzoyl-chloride is nitrated and the 4-nitro-1-(4¹-nitrobenzoyl-amino)-benzene-2-sulphonic acid is reduced with sodium sulphide. It is adsorbed by cotton, and the resulting bright yellow is converted to a reddish-yellow when diazotised and coupled with 1-phenyl-3-methyl-5-pyrazolone. In another example, 1-(4¹-nitrobenzoyl-amino)-4-nitro-naphthalene-6-sulphonic acid, the preparation of which is described, is reduced with sodium sulphide, diazotised and coupled as above.

323,713. Catalytic Processes. E. C. R. Marks, London. From E. I. Du Pont de Nemours and Co., Wilmington, Del., U.S.A. Application date, June 30, 1928.

Organic compounds are dehydrogenated or dehydrated by the use of a catalyst consisting of an oxide of a metal or silicon, which normally has both effects. The dehydrating effect can be repressed by adding an agent which is more basic than the catalyst, *e.g.*, alkali and alkaline earth metal oxides, carbonates, hydroxides, or salts with organic acids. The dehydrogenating effect can be repressed by adding strongly acidic oxides in the form of acids, ammonium salts, or anhydrides, *e.g.*, oxides of manganese, sulphur, chromium, phosphorus, arsenic, silicon, titanium, tin, boron, or aluminium. The catalyst itself may be an oxide of beryllium, magnesium, zinc, aluminium, silicon, titanium, germanium, zirconium, tin, cerium, thorium, vanadium, bismuth, chromium, molybdenum, tungsten, uranium, manganese, iron, or the rare earths. In an example, isopropanol vapour passed over a zinc oxide catalyst containing sodium carbonate yields acetone and a small proportion of propylene, but if zinc sulphate is used instead of sodium carbonate the proportion of propylene is greater than that of acetone. Another example describes the treatment of ethanol in the presence of uranium oxide and potassium carbonate or boric acid, to obtain acetaldehyde and ethylene.

323,718. Extracting Metals. S. G. S. Dicker, London. From Naamlooze Vennootschap Philips' Gloeilampenfabrieken, 6, Emmasingel, Eindhoven, Holland. Application date, August 3, 1928.

The reduction of alkali and alkaline earth metal compounds, *e.g.*, caesium sulphate or barium nitrate, is effected by an excess of the metals hafnium, zirconium, or titanium, in a vacuum or inert gas. A description is given of the production of these metals in combination with the manufacture of electric discharge tubes.

323,721. Synthetic Rubber. J. Y. Johnson, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, October 3, 1928.

Polymerised diolefines obtained from aqueous emulsions are treated with substances having a reducing action, such as sodium bisulphite or hydro-bisulphite, sodium formaldehyde sulphoxylate, stannous chloride, hydroxyl amine, hydrazine or its salts, phenols, naphthols, sols of metals or metal oxides, amines, etc. In an example, an emulsion of olein dissolved in isoprene with an aqueous solution of ammonia and glue is polymerised at 50° C. in the presence of hydrogen peroxide. Sodium hydrosulphite, phenol, or aniline solution is added, and precipitation effected in the usual manner. Another example describes the treatment of an emulsion of oleic acid, magnesium oleate and butadiene in aqueous ammonia.

323,748. Absorption of Olefines by Acids. H. D. Elkington, London. From Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij, 30, Carel van Bylandtlaan, The Hague. Application date, July 9, 1928.

Ethylene or its homologues or their polymerisation products are absorbed in strong acids such as sulphuric or phosphoric acids or a sulphonic acid, with or without strong organic acids, in the presence of catalysts consisting of metallic-cyano complexes such as ferri- or ferro-cyanic acids, or salts or compounds derived from them. Other suitable catalysts include cobalti-cyanic acid, cobalti-cobalto-cyanic acid, platino-cyanic acid, chromic-cyanic acid, or salts of these acids or compounds obtained by substituting one or more atoms or groups by other atoms or organic or inorganic radicles. The olefines may be obtained from natural gas or from distillation or hydrogenation gases, and may be dissolved in solvents such as gas oil. A number of examples of the above complex compounds suitable as catalysts are given, and also examples of the absorption of propylene in the presence of a catalyst consisting of potassium ferricyanide, sulphonic ferrocyanic acid, acetone-sodium-nitroprusside, β-ferricyanides, sodium-ferro-pentacyanic-carbonyl, barium-platino-cyanide, tetra-ethyl-ferrocyanide, diethyl-nitroprusside, or potassium-ferro-cyanide. Also the absorption of ethylene and α-butylene in the presence of various catalysts. The sulphates obtained may be hydrolysed to obtain ethyl alcohol, isopropyl alcohol, butyl alcohol, etc.

323,750. Dyes. J. Y. Johnson, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, August 25, 1928.

Anthanthrone and its derivatives are treated with strong nitric acid in 10 times the quantity of high boiling organic solvent such as nitrobenzene or its homologues, or chlorinated benzenes, mono-nitro-anthanthrones are obtained, and may be reduced to monoamino-anthanthrones by means of alkali sulphide, hydrosulphite, or hydrazine. To obtain dyestuffs, one or both reactive hydrogen atoms are replaced by negatively substituted organic compounds, *e.g.*, aliphatic, cyclo-aliphatic, aromatic, and heterocyclic compounds containing at least one negative substituent and which may be further substituted. The amino derivative may be treated with aldehydes to obtain azomethines. Examples are given of the production of mononitro-anthanthrone, monoamino-anthanthrone, and a number of derivatives. Also the condensation products of monoamino-anthanthrone with isophthalyl-chloride *m*-methoxy-benzoyl chloride, benzoyl chloride, 1-chloranthraquinone-2-carboxylic acid chloride, 1-amino-anthraquinone-2-carboxylic acid chloride, 1- and 2-chloranthraquinone, dibromanthanthrone, methylester of *p*-toluene sulphonic acid, *o*-chlorbenzaldehyde, 1-aminoanthraquinone-2-aldehyde, cyanuryl chloride, and octobrom-cyclohexane.

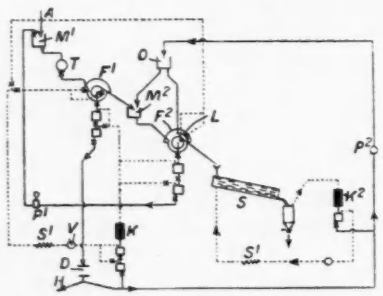
323,784. Purifying Oils. H. Wade, London. From Standard Oil Co., Chicago. Application date, July 10, 1928.

Petroleum oils containing naphthenic acids are treated with methyl, ethyl, or isopropyl alcohol which may be diluted with water. The extract is separated and the alcohol distilled off, leaving a semi-solid red residue which may be treated with acid and distilled in steam to obtain a pale yellow acid oil.

323,791. Extracting Oils. J. Y. Johnson, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, September 11, 1928. Addition to 312,657.

The residues obtained in the destructive hydrogenation of carbonaceous materials are treated with solvents such as the oils boiling below 300° C. obtained in the same destructive hydrogenation, *e.g.*, middle oils of boiling point 150°–300° C. Other suitable solvents include benzene, oils containing aromatic compounds, carbon disulphide, or heavy benzine. The treatment with solvent may be effected before the residue is

cooled below 150° C., and before the pressure in the hydrogenation chamber is released. The extract is filtered in a current of nitrogen or carbon dioxide, and the extracted residues may be subjected to low temperature carbonisation or high temperature steam treatment to obtain hydrogen. The residue from the destructive hydrogenation of coal containing 60 per cent. of oil is freed from low boiling constituents



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and treated in a vessel M^1 at 90° C. with the filtrate from a drum filter F^2. The mixture passes through the turbo-mixer T to a drum filter F^1, and the filtrate passes to a still D from which the heavy benzine passes through pump P^2 to a container O, and the oil is removed by a pipe H. The residue from the filter F^1 is treated in a mixer M^2 with benzine from the container O, and passes to a filter F^2 from which the filtrate passes through pump p^1 to the vessel M^1. The residue is washed with benzine, dried, and heated in a low temperature retort S. from which the volatile products pass to a condenser A^2. The drying is effected with hot nitrogen, drawn through the filters by a pump V, and afterwards freed from benzine, and reheated.

323,792. Dyeing Processes. British Celanese, Ltd., 22, Hanover Square, London, and G. H. Ellis, of British Celanese, Spondon, near Derby. Application date, October 5, 1928.

Cellulose esters and ethers are dyed by means of the monoazo, disazo or trisazo dyes obtained by coupling 1, 2 or 3 molecular parts of the same or different coupling components with diazotized aminonitro compounds containing two or more ary residues limited in any desired manner. Suitable diazo components include 2-nitrobenzidine, dinitrobenzidines, 5-nitro-*o*-tolidine 6 : 6^1-dinitro-*o*-dianisidine, 4-nitro-4^1-aminodiphenyl ether, 4 : 4^1-diamino-3 : 3^1-dinitro-diphenyl-sulphone, 2 : 4-dinitro-3^1-amino4^1-methyl-diphenylamine, 2-amino-5-nitrobenzanilide. Coupling components include xylidines, cresidines, anisidines, phenetidines, *m*-toluidine, *m*-phenylene-diamine, alkyl-, aryl-, or aralkylanilines, phenols, cresols, resorcinol, amino-phenols or alkylaminophenols, naphthylamines naphthylamine ethers, etc. A number of examples are given.

323,801. Chlorinated Train Oils. A. Carpmael, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, October 10, 1928.

Train oil is treated with chlorine until the temperature reaches 40-50° C. and the treatment continued for 12-15 hours until chlorine is no longer absorbed The temperature is raised to 70° C., air or gas passed through until only slightly acid, and then air or gas containing ammonia. A small proportion of monoethylaniline is added, and a light-coloured viscous product is obtained.

323,802. Cupric Cyanogen Compounds. A. Carpmael, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, October 10, 1928.

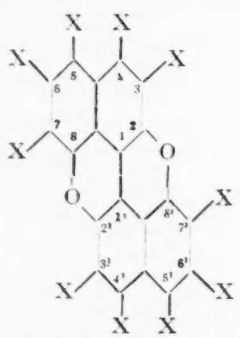
These compounds are made by adding ammonia to a cupric salt solution in insufficient amount to redissolve the precipitate. The paste is mixed with a salt of cyanic or thiocyanic acid. Alternatively, a cupric salt is treated with a cyanide or thiocyanide and an organic nitrogen compound such as methylamine, ethylene-diamine, urea, guanidine, aniline, pyridine, piperidene, etc. The insoluble cupric compounds produced are used as insecticides.

323,805. Purifying Oils. J. Y. Johnson, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, October 11, 1928.

Crude mineral, tar or lubricating oils or oils obtained by destructive distillation, are mixed with a purifying agent such as an aqueous solution of alkali, or sulphuric or metaphosphoric acid, and distilled in vacuo while passing in a stream of air, nitrogen, steam or vaporised hydrocarbons containing lower-boiling atomised liquids such as benzene, alcohol or water.

323,806. Dyes or Intermediates. A. Carpmael, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, October 11, 1928.

A derivative of β-naphthol having free 1- and 8- positions or of β-naphthol having free 8- and 8^1- positions is heated with a metallic oxide such as copper oxide or manganese oxide in a high-boiling solvent such as nitrobenzene or trichlorbenzene. The products are dinaphthylene dioxide derivatives of the general formula :—



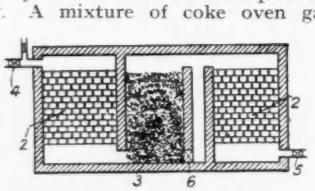
In an example, the *o*-toluidide of 2 : 3-oxynaphthoic acid is heated with pyrolusite in nitrobenzene to obtain di-*o*-toluidide of dinaphthylene dioxide-3 : 3^1-dicarboxylic acid. Examples are also given of the preparation of the corresponding dianilide, di-*m*-nitranilide, di-*p*-anisidide, di-α-naphthalide, and di-β-naphthalide, also the diethyl ester and the free acid ; the anhydride of the 4 : 5 : 4^1 : 5^1-tetracarboxylic acid of dinaphthylene dioxide, 6 : 6^1-dimethoxy-dinaphthylene dioxide and 7 : 7^1-dibenzoyl-diamino-dinaphthylene dioxide.

323,855. Catalytic Decomposition of Hydrocarbons. J. Y. Johnson, London. From I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. Application date, November 8, 1928.

Hydrogen is produced from mixtures of hydrocarbons with steam, carbon dioxide or oxygen, by the aid of a catalyst consisting of iron, nickel or cobalt mixed with aluminium compounds containing oxygen and silicon, hydrogen, carbon, boron, phosphorus, or sulphur. Alkaline earth metal oxides may also be added.

323,864. Obtaining Hydrogen and Carbon Monoxide from Gaseous Hydrocarbons. D. Tyrer, Norton Hall, The Green, Norton-on-Tees, and Imperial Chemical Industries, Ltd., Millbank, London. Application date, November 16, 1928.

Hydrocarbon vapours or gases are heated to yield hydrogen, carbon monoxide and carbon, and a limited amount of steam is added to the hydrocarbons so that the process is thermally self-supporting. A mixture of coke oven gas containing



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30 per cent. methane, with 5-16 per cent. of steam, passes through an inlet 4 to a regenerator 1, and thence to a coke bed 3, where the methane is decomposed. The gases pass through a regenerator 2 to heat it. Air is then blown in the reverse direction through the regenerator 2, coke bed 3, and

regenerator 1, to reheat the coke bed. Some air may be passed through a valve 6 to burn the carbon monoxide.

323,948. NITRILES. J. Y. Johnson, London. From I.G. Farbenindustries Akt.-Ges., Frankfort-on-Main, Germany. Application date, February 11, 1929.

Amides or ammonium salts of organic monobasic acids are treated with benzo-trichloride or its substitution products. Equimolecular proportions of the benzo-trichloride and an amide yield a nitrile and the benzoyl chloride. When the molecular proportions are 1 : 2, the products are the nitrile and the benzoic acid, and with equimolecular proportions of the benzo-trichloride and ammonium salt of a carboxylic acid, the products are the nitrile and the benzoic acid. When the molecular proportions in the last reaction are 2 : 1, the products are the nitrile and the benzoyl chloride. Catalysts such as zinc, aluminium, or ferric chloride may be employed. Examples are given of the reaction of benzo-trichloride and acetamide to obtain aceto-nitrile and benzoyl chloride or benzoic acid; 2 : 4-dichloro-benzo-trichloride and acetamide to obtain acetonitrile and 2 : 4-dichlor-benzoic acid; benzo-trichloride and benzamide to obtain benzonitrile and benzoic acid or benzoyl chloride; also the production of crotonic nitrile by the action of crotonic amide on benzo-trichloride.

NOTE.—Abstracts of the following specifications which are now accepted, appeared in THE CHEMICAL AGE when they became open to inspection under the International Convention: 295,322 (Canadian Electro Products Co., Ltd.), relating to synthetic gummy or resinous material, see Vol. XIX, p. 369; 306,094 (U. B. Voisin), relating to elimination of iron contained in bauxites or other aluminous ores, see Vol. XX, p. 411; 307,013 (Goodyear Tire and Rubber Co.), relating to manufacture of rubber, see Vol. XX, p. 454; 308,275 (I.G. Farbenindustrie Akt.-Ges.), relating to vulcanization of natural or artificial rubber, see Vol. XX, p. 508; 312,174 (Soc. of Chemical Industry in Basle), relating to condensation products from 1 : 3 : 3-trimethyl-2-methylene-indolins, see Vol. XXI, p. 90.

Specifications Accepted with Date of Application

296,000. Cracking of oils. S. Seelig. August 22, 1927.

298,955. Oxythionaphthenes, Manufacture of. I.G. Farbenindustrie Akt.-Ges. October 17, 1927.

299,765 and 301,061. Removing ammonia and sulphuretted hydrogen from gases. C. J. Hansen. October 31, 1927, and November 24, 1927. 301,061 addition to 299,765.

300,557. Azo-dyestuffs, Manufacture of. I.G. Farbenindustrie Akt.-Ges. November 14, 1927.

300,923. Glacial acetic acid from aqueous acetic acid, Manufacture of. I.G. Farbenindustrie Akt.-Ges. November 19, 1927.

300,987. Polyazo dyestuffs, Manufa ctureof. I.G. Farbenindustrie Akt.-Ges. November 22, 1927.

301,499. Hydrogen, Preparation of—and the absorption of carbon dioxide from gas mixtures. F. Gülker. December 1, 1927. Addition to 275,273.

303,022. Condensation products of cresol and formaldehyde, Manufacture of. P. Chestakoff. December 22, 1927.

306,086. Raw phosphates, Decomposition of. A. Messerschmitt. February 15, 1928. Addition to 300,961.

309,577. Ketene, Production of. Kodak, Ltd. April 13, 1928.

309,598. Purification of impure titanium dioxide. Deutsche Gasluhlicht-Auer-Ges. April 14, 1928.

311,725. Thiocyanates, Treatment of. C. J. Hansen. May 15, 1928.

314,812. Waste alkali liquors, Purification of. I.G. Farbenindustrie Akt.-Ges. July 2, 1928.

316,284. Extraction of acetic acid from pyroligneous acid. Soc. Anon. des Distilleries des Deux-Sèvres. July 28, 1928.

325,475. Nitrous oxide from ammonia, Manufacture of. J. Y. Johnson. (*I.G. Farbenindustrie Akt.-Ges.*) November 12, 1928.

325,485. Azo dyestuffs, Production of. J. Y. Johnson. (*I.G. Farbenindustrie Akt.-Ges.*) November 12, 1928.

325,509. Synthetic menthol, Manufacture of. Howards and Sons, Ltd., J. W. Blagden and W. E. Huggett. November 19, 1928.

325,512. Chemical products from wood, Manufacture of. A. Carpmael. (*I.G. Farbenindustrie Akt.-Ges.*) November 19, 1928.

325,519. Sulphur dyestuffs, Manufacture of. A. Carpmael. (*I.G. Farbenindustrie Akt.-Ges.*) November 20, 1928. Addition to 315,910.

325,525. Halogen derivatives of the dibenzanthrone and isodibenzanthrone series, Manufacture of. J. Y. Johnson. (*I.G. Farbenindustrie Akt.-Ges.*) August 21, 1928.

325,531. Esters of α-hydroxy-carboxylic acids, Production of. J. Y. Johnson. (*I.G. Farbenindustrie Akt.-Ges.*) October 20, 1928. Addition to 300,040.

325,533. Phosphoric acid and hydrogen, Production of. J. Y Johnson. (*I.G. Farbenindustrie Akt.-Ges.*) November 16, 1928.

325,550. Nitrogenous vat dyestuffs, Production of. J. Y. Johnson. (*I.G. Farbenindustrie Akt.-Ges.*) October 15, 1928. Addition to 318,180.

325,557. Ammonia, Process and apparatus for use with. J. Y. Johnson. (*I.G. Farbenindustrie Akt.-Ges.*) September 15, 1928.

325,562. Discharge basic dyeings. A. Carpmael. (*I.G. Farbenindustrie Akt.-Ges.*) October 23, 1928.

324,563. Materials for use in dyeing and printing, Manufacture of. A. Carpmael. (*I.G. Farbenindustrie Akt.-Ges.*) October 23, 1928.

325,641. White lithopone from incompletely purified zincic solutions, Method for preparing. M. Bidaine. December 27, 1928.

325,650. Crystallisation of salts. P. H. Muller. January 2, 1929.

325,669. Ketones, Manufacture of. O. Y. Imray. (*I.G. Farbenindustrie Akt.-Ges.*) January 28, 1929.

325,695. Ethylene, Production of. J. Y. Johnson. (*I.G. Farbenindustrie Akt.-Ges.*) February 22, 1929.

325,762. Beryllium alloys, in particular those with a high beryllium content, Production of—by means of fused electrolysis. Siemens and Halske Akt.-Ges. November 13, 1928.

325,772. β-naphthol and other difficultly filterable organic compounds, Recovery of. R. F. Stewart, R. J. Venn and Dorr Co., Ltd. July 1, 1929.

Applications for Patents

[In the case of applications for patents under the International Convention, the priority date (that is, the original application date abroad which the applicant desires shall be accorded to the patent) is given in brackets, with the name of the country of origin. Specifications of such applications are open to inspection at the Patent Office on the anniversary of the date given in brackets, whether or not they have been accepted.]

Adam, W. G., Cuckney, M., Gas Light and Coke Co., and Shannon, S. J. L. Catalytic oxidation of toluene, etc. 6,986. March 3. (January 29, 1929.)

Carpmael, A., and I.G. Farbenindustrie Akt.-Ges. Refining cellulose. 7,103. March 4.

—— Manufacture of azo dyestuffs insoluble in water. 7,245. March 5.

—— Manufacture of rubber-like masses. 7,246. March 5.

—— Manufacture of 2-imidazolone derivatives. 7,401. March 6.

—— Polymerisation of diolefines. 7,402. March 6.

—— Manufacture of materials resistant to or free from nitro-organisms. 7,403. March 6.

—— Manufacture of mixed fatty acid esters of cellulose. 7,526. March 7.

Gas Light and Coke Co. Conversion of hydrocarbons. 7,639. March 8.

Goodyear, E. H., Imperial Chemical Industries, Ltd., and Scholefield, F. Treatment of dyed cotton, etc. 7,059. March 4.

Graesser-Monsanto Chemical Works, Ltd., and Monsanto Chemical Works. Manufacture of acetylsalicylic acid compositions. 7,630. March 8.

Groves, W. W., and I.G. Farbenindustrie Akt.-Ges. Manufacture of therapeutic agents. 6,943. March 3.

I.G. Farbenindustrie Akt.-Ges., and Johnson, J. Y. Deresinification of products. 6,929. March 3.

—— Artificial masses. 6,930. March 3.

—— Production of impregnated, etc., articles. 6,931. March 3.

—— Manufacture of therapeutic agents. 6,943. March 3.

—— Purification of resinous, etc., products and hydrocarbons. 7,516. March 7.

I.G. Farbenindustrie Akt.-Ges. Insulators for sparking-plugs. 6,994. March 3. (Germany, March 1, 1929.)

—— Manufacture of carbohydrate esters. 7,073. March 4. (Germany, March 4, 1929.)

—— Production of insoluble azo-dyestuffs on cellulose, etc. 7,378. March 6. (Germany, March 6, 1929.)

Imperial Chemical Industries, Ltd. Separable fasteners. 7,114. March 4.

—— Applications of moulds and apparatus therefor. 7,202. March 5.

—— Casting copper. 7,203. March 5.

—— Removing sulphur compounds from gases. 7,321. March 6.

—— Removal of solids from hot or corrosive gases. 7,322. March 6.

—— Manufacture of coloured electric light bulbs. 7,300. March 6.

Low, F. S. Electrolytic manufacture of chlorine. 7,503. March 7.

Soc. Anon. Ledoga Prodotti Chimici e Farmaceutici. Preparing physiologically-active quinazoline derivatives. 7,281. March 5. (Germany, May 30, 1929.)

Soc. d'Etudes Scientifiques et d'Entreprises Industrielles. Manufacture of fertilisers. 7,678. March 8. (Germany, March 9, 1929.)

Soc. Française de Catalyse Généralisée. Process for obtaining from a determined alcohol an organic body having one atom of carbon more than the said alcohol. 7,267. March 5. (France, December 7, 1929.)

Weekly Prices of British Chemical Products

The prices and comments given below respecting British chemical products are based on direct information supplied by the British manufacturers concerned. Unless otherwise qualified, the figures quoted apply to fair quantities, net and naked at makers' works.

General Heavy Chemicals

ACID ACETIC, 40% TECH.—£19 per ton.

ACID, CHROMIC.—1s. 0⅝d. per lb. d/d U.K.

ACID HYDROCHLORIC.—Spot, 3s. 9d. to 6s. per carboy d/d, according to purity, strength and locality.

ACID NITRIC, 80° Tw.—Spot £20 to £25 per ton, makers' works according to district and quality.

ACID SULPHURIC.—Average National prices f.o.r. makers' works, with slight variations up and down owing to local considerations; 140° Tw., Crude Acid, 60s. per ton. 168° Tw., Arsenical, £5 10s. per ton. 168° Tw., Non-arsenical, £6 15s. per ton.

AMMONIA (ANHYDROUS).—Spot, 10d. per lb., d/d in cylinders.

AMMONIUM BICHROMATE.—8¼d. per lb. d/d U.K.

BISULPHITE OF LIME.—£7 10s. per ton, f.o.r. London, packages free.

BLEACHING POWDER, 35%.—Spot, £7 10s. per ton d/d station in casks, special terms for contracts.

BORAX, COMMERCIAL.—Crystals, £19 10s. to £20 per ton; granulated, £12 10s. per ton; powder, £14 per ton. (Packed in 1 cwt. bags carriage paid any station in Great Britain. Prices quoted are for one ton lots and upwards.

CALCIUM CHLORIDE (SOLID).—Spot, £4 15s. to £5 5s. per ton d/d in drums.

CHROMIUM OXIDE.—9¾d. and 10¼d. per lb. according to quantity d/d U.K.

CHROMOTAN.—Crystals, 3⅜d. per lb. Liquor, £8 15s. per ton d/d U.K.

COPPER SULPHATE.—£25 to £25 10s. per ton.

METHYLATED SPIRIT 61 O.P.—Industrial, 1s. 3d. to 1s. 8d. per gall. pyridinised industrial, 1s. 5d. to 1s. 10d. per gall.; mineralised 2s. 4d. to 2s. 8d. per gall.; 64 O.P., 1d. extra in all cases.

NICKEL SULPHATE.—£38 per ton d/d.

NICKEL AMMONIA SULPHATE.—£38 per ton d/d.

POTASH CAUSTIC.—£30 to £33 per ton.

POTASSIUM BICHROMATE CRYSTALS AND GRANULAR.—4⅜d. per lb. nett d/d U.K. spot; ground ½d. per lb. extra.

POTASSIUM CHLORATE.—3¾d. per lb., ex-wharf, London, in cwt. kegs.

POTASSIUM CHROMATE.—8¼d. per lb. d/d U.K.

SALAMMONIAC.—Firsts lump, spot, £42 10s. per ton d/d station in barrels. Chloride of ammonia, £37 to £45 per ton, carr. paid.

SALT CAKE, UNGROUND.—Spot, £3 7s. 6d. per ton d/d station in bulk.

SODA ASH, 58° E.—Spot, £6 per ton, f.o.r. in bags, special terms for contracts.

SODA CAUSTIC, SOLID, 76/77%.—Spot, £14 10s. per ton, d/d station.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton, d/d station or ex depot in 2 cwt. bags.

SODIUM ACETATE 97/98%.—£21 per ton.

SODIUM BICARBONATE, REFINED.—Spot, £10 10s. per ton d/d station in bags.

SODIUM BICHROMATE CRYSTALS.—3⅝d. per lb. nett d/d U.K. spot. Anhydrous ¾d. per lb. extra.

SODIUM BISULPHITE POWDER, 60/62%.—£17 10s. per ton delivered for home market, 1-cwt. drums included; £15 10s. f.o.r. London.

SODIUM CHLORATE.—2¾d. per lb.

SODIUM CHROMATE.—3½d. per lb d/d U.K.

SODIUM NITRITE.—Spot, £19 per ton, d/d station in drums.

SODIUM PHOSPHATE.—£14 per ton, f.o.b. London, casks free.

SODIUM SILICATE, 140° Tw.—Spot, £8 5s. per ton, d/d station returnable drums.

SODIUM SULPHATE (GLAUBER SALTS).—Spot, £4 2s. 6d. per ton, d/d address in bags.

SODIUM SULPHIDE CONC. SOLID.—Spot, £10 5s. per ton d/d in drums. Crystals—Spot, £7 10s. per ton d/d in sellers' casks.

SODIUM SULPHITE, PEA CRYSTALS.—Spot, £13 10s. per ton, d/d station in kegs. Commercial—Spot, £9 per ton, d/d station.

Coal Tar Products

ACID CARBOLIC CRYSTALS.—7d. to 7½d. per lb. Crude 60's, 2s. 4½d. to 2s. 5d. Jan.-June, 2s. 4d. July-Dec. per gall.

ACID CRESYLIC 99/100.—2s. 2d. to 2s. 6d. per gall. Pure, 5s. 6d. per gall. 97/99.—2s. 1d. to 2s. 2d. per gall. Pale, 95%, 1s. 9d. to 1s. 10d. per gall. 98%, 2s. 1d. to 2s. 3d. Dark, 1s. 6d. to 1s. 10d. Refined, 2s. 7d. to 2s. 10d. per gall.

ANTHRACENE.—A quality, 2d. to 2½d. per unit. 40%, £4 10s. per ton.

ANTHRACENE OIL, STRAINED, 1080/1090.—4⅜d. to 5½d. per gall. 1100, 5½d. to 6d. per gall.; 1110, 6d. to 6½d. per gall. Unstrained (Prices only nominal).

BENZOLE.—Prices at works: Crude, 10d. to 11d. per gall.; Standard Motor, 1s. 5d. to 1s. 6d. per gall.; 90%, 1s. 7d. to 1s. 8d. per gall.; Pure, 1s. 10d. to 1s. 11d. per gall.

TOLUOLE.—90%, 1s. 9d. to 2s. 1d. per gall. Firm. Pure, 1s. 11d. to 2s. 5d. per gall.

XYLOL.—1s. 5d. to 1s. 10d. per gall. Pure, 1s. 8d. to 2s. 1d. per gall.

CREOSOTE.—Cresylic, 20/24%, 6¾d. to 7d. per gall.; Heavy, for Export, 6¼d. to 6⅝d. per gall. Home, 4½d. per gall. d/d. Middle oil, 4¼d. to 5d. per gall. Standard specification, 3d. to 4d. per gall. Light gravity, 1¼d. to 1⅝d. per gall. ex works. Salty, 7½d. per gall.

NAPHTHA.—Crude, 8½d. to 8¾d. per gall. Solvent, 90/160, 1s. 3d. to 1s. 3½d. per gall. Solvent, 95/160, 1s. 4d. to 1s. 6d. per gall. Solvent 90/190, 1s. to 1s. 2½d. per gall.

NAPHTHALENE, CRUDE.—Drained Creosote Salts, £4 10s. to £5 per ton. Whizzed, £5 per ton. Hot pressed, £8 10s. per ton.

NAPHTHALENE.—Crystals, £12 5s. per ton. Purified Crystals, £14 10s. per ton. Flaked, £14 to £15 per ton, according to districts.

PITCH.—Medium soft, 46s. to 47s. 6d. per ton, f.o.b., according to district. Nominal.

PYRIDINE.—90/140, 3s. 9d. to 4s. per gall. 90/160, 3s. 6d. to 3s. 9d. per gall. 90/180, 1s. 9d. to 2s. 3d. per gall. Heavy prices only nominal.

Intermediates and Dyes

In the following list of Intermediates delivered prices include packages except where otherwise stated:

ACID AMIDONAPHTHOL DISULPHO (1-8-2-4).—10s. 9d. per lb.

ACID ANTHRANILIC.—6s. per lb. 100%.

ACID BENZOIC.—1s. 8½d. per lb.

ACID GAMMA.—3s. 9d. per lb. 100% d/d buyer's works.

ACID H.—2s. 3d. per lb. 100% d/d buyer's works.

ACID NAPHTHIONIC.—1s. 6d. per lb. 100% d/d buyer's works.

ACID NEVILLE AND WINTHER.—2s. 7d. per lb. 100% d/d buyer's works.

ACID SULPHANILIC.—8½d. per lb. 100% d/d buyer's works.

ANILINE OIL.—8½d. per lb., drums extra, d/d buyer's works.

ANILINE SALTS.—8½d. per lb. d/d buyer's works.

BENZALDEHYDE.—1s. 8d. per lb., packages extra, d/d buyer's works.

BENZIDINE BASE.—2s. 4d. per lb. 100% d/d buyer's works.

BENZOIC ACID.—1s. 8½d. per lb. d/d buyer's works.

o-CRESOL 29/31° C.—£3 1s. 10d. per cwt., in 1 ton lots.

m-CRESOL 98/100%.—2s. 9d. per lb., in ton lots d/d.

p-CRESOL 32/34° C.—2s. per lb., in ton lots d/d.

DICHLORANILINE.—1s. 10d. per lb.

DIMETHYLANILINE.—1s. 9½d. per lb., drums extra d/d buyer's works.

DINITROBENZENE.—8d. per lb.

DINITROCHLORBENZENE.—£74 per ton d/d.

DINITROTOLUENE.—48/50° C., 7½d. per lb.; 66/68° C., 9d. per lb.

DIPHENYLAMINE.—1s. 8d. per lb. d/d buyer's works.

a-NAPHTHOL.—1s. 11d. per lb. d/d buyer's works.

B-NAPHTHOL.—£65 per ton in 1 ton lots, d/d buyer's works.

a-NAPHTHYLAMINE.—1s. per lb. d/d buyer's works.

B-NAPHTHYLAMINE.—2s. 9d. per lb. d/d buyer's works.

o-NITRANILINE.—5s. 11d. per lb.

m-NITRANILINE.—2s. 6d. per lb. d/d buyer's works.

p-NITRANILINE.—1s. 8d. per lb. d/d buyer's works.

NITROBENZENE.—6½d. per lb, 5-cwt. lots, drums extra, d/d buyer's works.

NITRONAPHTHALENE.—9d. per lb.

R. SALT.—2s. per lb. 100% d/d buyer's works.

SODIUM NAPHTHIONATE.—1s. 6½d. per lb. 100% d/d buyer's works.

o-TOLUIDINE.—8d. per lb., drums extra, d/d buyer's works.

p-TOLUIDINE.—1s. 9d. per lb. d/d buyer's works.

m-XYLIDINE ACETATE.—3s. 1d. per lb. 100%.

N. W. ACID.—4s. 9d. per lb. 100%.

Wood Distillation Products

ACETATE OF LIME.—Brown, £9 15s. to £10 5s. per ton. Grey, £16 10s. to £17 10s. per ton. Liquor, 9d. per gall.

ACETONE.—£78 per ton.

CHARCOAL.—£6 to £8 10s. per ton, according to grade and locality.

IRON LIQUOR.—1s. 3d. per gall. 32° Tw. 1s. per gall. 24° Tw.

WOOD CREOSOTE.—1s. 9d. per gall., unrefined.

WOOD NAPHTHA, MISCIBLE.—3s. 8d. to 3s. 11d per gall. Solvent, 4s. to 4s. 3d. per gall.

WOOD TAR.—£3 10s. to £4 10s. per ton

BROWN SUGAR OF LEAD.—£38 per ton.

Rubber Chemicals

ANTIMONY SULPHIDE.—Golden, 6½d. to 1s. 3d. per lb. according to quality; Crimson, 1s. 3d. to 1s. 5d. per lb., according to quality.

ARSENIC SULPHIDE, YELLOW.—1s. 8d. to 1s. 10d. per lb.

BARYTES.—£5 10s. to £7 per ton, according to quality.

CADMIUM SULPHIDE.—5s. to 6s. per lb.

CARBON BISULPHIDE.—£25 to £27 10s. per ton, according to quantity.

CARBON BLACK.—4 1/16d. to 4½d. per lb., ex wharf.

CARBON TETRACHLORIDE.—£40 to £50 per ton, according to quantity, drums extra.

CHROMIUM OXIDE, GREEN.—1s. 2d. per lb.

DIPHENYLGUANIDINE.—3s. 6d. per lb.

LITHOPONE, 30%.—£20 to £22 per ton.

SULPHUR.—£9 10s. to £13 per ton, according to quality.

SULPHUR CHLORIDE.—4d. to 7d. per lb., carboys extra.

SULPHUR PRECIP. B.P.—£55 to £60 per ton.

ZINC SULPHIDE.—8d. to 11d. per lb

Pharmaceutical and Photographic Chemicals

ACID, ACETIC, PURE, 80%.—£37 per ton, ex wharf London, barrels free.

ACID, ACETYL SALICYLIC.—2s. 9d. to 2s. 10½d. per lb., according to quantity.

ACID, BENZOIC B.P.—2s. to 3s. 3d. per lb., according to quantity. Solely ex Gum, 1s. 6d. per oz.; 50-oz. lots, 1s. 3d. per oz.

ACID, BORIC B.P.—Crystal, £32 per ton; powder, £36 per ton; For one ton lots and upwards. Packed in 1-cwt. bags carriage paid any station in Great Britain.

ACID, CAMPHORIC.—19s. to 21s. per lb.

ACID, CITRIC.—1s. 10¼d. to 1s. 10½d. per lb., less 5%.

ACID, GALLIC.—2s. 8d. per lb. for pure crystal, in cwt. lots.

ACID, MOLYBDIC.—5s. 3d. per lb. in ½ cwt. lots. Packages extra. Special prices for quantities and contracts.

ACID, PYROGALLIC, CRYSTALS.—7s. 3d. per lb. Resublimed, 8s. 3d.

ACID, SALICYLIC, B.P. PULV.—1s. 5d. to 1s. 6d. per lb. Technical.—1s. to 1s. 2d. per lb.

ACID, TANNIC B.P.—2s. 8d. to 2s. 10d. per lb.

ACID, TARTARIC.—1s. 3¼d. per lb., less 5%.

ACETANILIDE.—1s. 5d. to 1s. 8d. per lb. for quantities.

AMIDOL.—7s. 6d. to 9s. per lb., d/d.

AMIDOPYRIN.—7s. 9d. to 8s. per lb.

AMMONIUM BENZOATE.—3s. 3d. to 3s. 9d. per lb., according to quantity. 18s. per lb. ex Gum.

AMMONIUM CARBONATE B.P.—£36 per ton. Powder, £39 per ton in 5 cwt. casks. Resublimated, 1s. per lb.

AMMONIUM MOLYBDATE.—4s. 9d. per lb. in ½ cwt. lots. Packages extra. Special prices for quantities and contracts.

ATROPHINE SULPHATE.—9s. per oz.

BARBITONE.—5s. 9d. to 6s. per lb.

BENZONAPHTHOL.—3s. to 3s. 3d. per lb .spot.

BISMUTH CARBONATE.—8s. 9d. per lb.

BISMUTH CITRATE.—8s. 3d. per lb.

BISMUTH SALICYLATE.—8s 3d. per lb.

BISMUTH SUBNITRATE.—7s. 6d. per lb.

BISMUTH NITRATE.—Cryst. 5s. 3d. per lb.

BISMUTH OXIDE.—11s. 3d. per lb.

BISMUTH SUBCHLORIDE.—10s. 3d. per lb.

BISMUTH SUBGALLATE.—7s. 3d. per lb. Extra and reduced prices for smaller and larger quantities of all bismuth salts respectively.

BISMUTHI ET AMMON LIQUOR.—Cit. B.P. in W. Qts. 1s. 0½d. per lb.; 12 W. Qts. 11½d. per lb.; 36 W. Qts. 11d. per lb.

BORAX B.P.—Crystal, £21 per ton; powder, £22 per ton; For one ton lots and upwards. Packed in 1-cwt. bags carriage paid any station in Great Britain.

BROMIDES.—Ammonium, 2s. 0d. per lb.; potassium, 1s. 8d. per lb.; granular, 1s. 5¼d. to 1s. 7¾d. per lb.; sodium, 1s. 11d. per lb. Prices for 1 cwt. lots.

CALCIUM LACTATE.—B.P., 1s. 3d. to 1s. 5d. per lb., in 1-cwt. lots.

CAMPHOR.—Refined flowers, 3s. 3d. to 3s. 4d. per lb., according to quantity; also special contract prices.

CHLORAL HYDRATE.—3s. 1d. to 3s. 4d. per lb.

CHLOROFORM.—2s. 4½d. to 2s. 7½d. per lb., according to quantity.

CREOSOTE CARBONATE.—6s. per lb.

ETHERS.—S.G. ·730—11d. to 1s. per lb., according to quantity; other gravities at proportionate prices.

FORMALDEHYDE, 40%.—37s. per cwt., in barrels, ex wharf.

GUAIACOL CARBONATE.—4s. 6d. to 4s. 9d. per lb.

HEXAMINE.—2s. 3d. to 2s. 6d. per lb.

HOMATROPINE HYDROBROMIDE.—30s. per oz.

HYDRASTINE HYDROCHLORIDE.—English make offered at 120s. per oz.

HYDROGEN PEROXIDE (12 VOLS.).—1s. 4d. per gallon, f.o.r. makers' works, naked. Winchesters, 2s. 11d. per gall. B.P., 10 vols., 2s. to 2s. 3d. per gall.; 20 vols., 4s. per gall.

HYDROQUINONE —3s. 9d. to 4s. per lb., in cwt. lots.

HYPOPHOSPHITES.—Calcium, 2s. 5d. per lb.; potassium, 2s. 8½d. per lb.; sodium, 2s. 7½d. per lb., in 1 cwt. lots, assorted.

IRON AMMONIUM CITRATE.—B.P., 2s. 8d. to 2s. 9d. per lb. Green, 2s. 10d. to 3s. per lb. U.S.P., 2s. 7d. to 2s. 10d. per lb.

IRON PERCHLORIDE.—18s. to 20s. per cwt., according to quantity.

IRON QUININE CITRATE.—B.P., 8¾d. to 9¼d. per oz., according to quantity.

MAGNESIUM CARBONATE.—Light commercial, £31 per ton net.

MAGNESIUM OXIDE.—Light commercial, £62 10s. per ton, less 2½%; Heavy commercial, £21 per ton, less 2½%; in quantity lower; Heavy Pure, 2s. to 2s. 3d. per lb.

MENTHOL.—A.B.R. recrystallised B.P., 17s. per lb. net; Synthetic, 9s. 6d. to 11s. 9d. per lb.; Synthetic detached crystals, 9s. 6d. to 11s. per lb., according to quantity; Liquid (95%), 9s. per lb.

MERCURIALS B.P.—Up to 1 cwt. lots, Red Oxide, crystals, 8s. 4d. to 8s. 5d. per lb., levig., 7s. 10d. to 7s. 11d. per lb.; Corrosive Sublimate, Lump, 6s. 7d. to 6s. 8d. per lb., Powder, 6s. to 6s. 1d. per lb.; White Precipitate, Lump, 6s. 9d. to 6s. 10d. per lb., Powder, 6s. 10d. to 6s. 11d. per lb., Extra Fine, 6s. 11d. to 7s. per lb.; Calomel, 7s. 2d. to 7s. 3d. per lb.; Yellow Oxide, 7s. 8d. to 7s. 9d. per lb.; Persulph, B.P.C., 6s. 11d. to 7s. per lb.; Sulph. nig., 6s. 8d. to 6s. 9d. per lb. Special prices for larger quantities.

METHYL SALICYLATE.—1s. 3d. to 1s. 5d. per lb.

METHYL SULPHONAL.—18s. 6d. to 20s. per lb.

METOL.—9s. to 11s. 6d. per lb. British make.

PARAFORMALDEHYDE.—1s 9d. per lb. for 100% powder.

PARALDEHYDE.—1s. 4d. per lb.

PHENACETIN.—3s. 8½d. to 4s. 1d. per lb.

PHENAZONE.—5s. 11d. to 6s. 1½d. per lb.

PHENOLPHTHALEIN.—5s. 11d. to 6s. 1½d. per lb.

POTASSIUM BITARTRATE 99/100% (Cream of Tartar).—103s. per cwt., less 2½ per cent.

POTASSIUM CITRATE.—B.P.C., 2s. 6d. per lb. in 28 lb. lots. Smaller quantities 1d. per lb. more.

POTASSIUM FERRICYANIDE.—1s. 9d. per lb., in cwt. lots.

POTASSIUM IODIDE.—16s. 8d. to 17s. 2d. per lb., according to quantity.

POTASSIUM METABISULPHITE.—6d. per lb., 1-cwt. kegs included f.o.r. London.

POTASSIUM PERMANGANATE.—B.P. crystals, 5½d per lb., spot.

QUININE SULPHATE.—1s. 8d. to 1s. 9d. per oz., bulk in 100 oz. tins

RESORCIN.—2s. 10d. to 3s. per lb., spot.

SACCHARIN.—43s. 6d. per lb.

SALOL.—2s. 3d. to 2s. 6d. per lb.

SODIUM BENZOATE B.P.—1s. 9d. per lb. for 1-cwt. lots.

SODIUM CITRATE, B.P.C., 1911, AND U.S.P. VIII.—2s. 2d. per lb., B.P.C. 1923, and U.S.P. IX—2s. 6d. per lb. Prices for 28 lb. lots. Smaller quantities 1d. per lb. more.

SODIUM FERROCYANIDE.—4d. per lb., carriage paid.

SODIUM HYPOSULPHITE, PHOTOGRAPHIC.—£15 per ton, d/d consignee's station in 1-cwt. kegs.

SODIUM NITROPRUSSIDE.—16s. per lb.

SODIUM POTASSIUM TARTRATE (ROCHELLE SALT).—100s. per cwt. Crystals, 5s. per cwt. extra.

SODIUM SALICYLATE.—Powder, 1s. 10d. to 2s. per lb. Crystal, 1s. 11d. to 2s. 2d. per lb.

SODIUM SULPHIDE, PURE RECRYSTALLISED.—10d. to 1s. 1d. per lb.

SODIUM SULPHIDE, ANHYDROUS.—£27 10s. to £29 10s. per ton, according to quantity. Delivered U.K.

SULPHONAL.—9s. 6d. to 10s. per lb.

TARTAR EMETIC, B.P.—Crystal or powder, 1s. 9d. to 1s. 10d. per lb.

THYMOL.—Puriss, 7s. 6d. to 8s. 6d. per lb., according to quantity. Firmer. Natural, 12s. per lb.

Perfumery Chemicals

ACETOPHENONE.—7s. per lb.

AUBEPINE (EX ANETHOL).—12s. per lb.

AMYL ACETATE.—2s. 6d. per lb.

AMYL BUTYRATE.—5s. per lb.

AMYL CINNAMIC ALDEHYDE.—12s. per lb.

AMYL SALICYLATE.—3s. per lb.

ANETHOL (M.P. 21/22° C.).—6s. 6d. per lb.

BENZALDEHYDE FREE FROM CHLORINE.—2s. 6d. per lb.

BENZYL ACETATE FROM CHLORINE-FREE BENZYL ALCOHOL.—2s. per lb.

BENZYL ALCOHOL FREE FROM CHLORINE.—2s. per lb.

BENZYL BENZOATE.—2s. 3d. per lb.

CINNAMIC ALDEHYDE NATURAL.—13s. 3d. per lb.

COUMARIN.—8s. 3d. per lb.

CITRONELLOL.—10s. 6d. per lb.

CITRAL.—8s. per lb.

ETHYL CINNAMATE.—6s. 6d. per lb.

ETHYL PHTHALATE.—2s. 9d. per lb.

EUGENOL.—9s. per lb.

GERANIOL (PALMAROSA).—19s. per lb.

GERANIOL.—7s. 6d. to 10s. per lb.

HELIOTROPINE.—7s. per lb.

ISO EUGENOL.—11s. 9d. per lb.

LINALOL.—Ex Bois de Rose, 12s. per lb. Ex Shui Oil, 10s. per lb.

PHENYL ETHYL ACETATE.—11s. per lb.

PHENYL ETHYL ALCOHOL.—9s. 6d. per lb.

RHODINOL.—48s. per lb.

SAFROL.—2s. per lb.

TERPINEOL.—1s. 6d. per lb.

VANILLIN, EX CLOVE OIL.—13s. to 15s. per lb. Ex Guaiacol, 12s. 6d. to 14s. per lb.

Essential Oils

ALMOND OIL.—Foreign S.P.A., 10s. per lb.

ANISE OIL.—4s. 3d. per lb.

BERGAMOT OIL.—11s. 3d per lb.

BOURBON GERANIUM OIL.—17s. 6d. per lb.

CAMPHOR OIL, WHITE.—16os. per lb.

CASSIA OIL, 80/85%.—4s. 9d. per lb.

CINNAMON OIL LEAF.—7s. 9d. per oz.

CITRONELLA OIL.—Java, 2s. 8d. per lb., c.i.f. U.K. port; pure, Ceylon, 2s. 6d. per lb.

CLOVE OIL (90/92%).—6s. 6d. per lb.

EUCALYPTUS OIL, AUSTRALIAN, B.P. 70/75%.—1s. 9d. per lb.

LAVENDER OIL.—Mont Blanc, 38/40%, 11s. 6d. per lb.

LEMON OIL.—6s. per lb.

LEMONGRASS OIL.—4s. per lb.

ORANGE, SWEET.—11s. 9d. per lb.

London Chemical Market

The following notes on the London Chemical Market are specially supplied to THE CHEMICAL AGE *by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., and may be accepted as representing these firms' independent and impartial opinions.*

London, March 13, 1930.

A FAIR amount of business has been booked during the past week, and there is very little change in prices. Export business has been fair.

General Chemicals

ACETONE.—Steady demand with prices unchanged at £71 10s. to £80 per ton.

ACID ACETIC.—Good request at £36 10s. per ton for 80% technical and £37 10s. per ton for 80% edible.

ACID LACTIC.—Steady at £43 per ton for the 50% by weight, pale grade.

ACID OXALIC.—The increased volume of business still continues with price very firm at £30 7s. 6d. to £32 per ton, according to quantity.

ACID TARTARIC.—Unchanged at about 1s. 3½d. per lb., less 5%.

ALUMINA SULPHATE.—Firm at £8 to £8 15s. per ton for 17–18% iron free quality.

ARSENIC.—£16 5s. to £16 10s. per ton free on rails at mines.

BORAX.—There is increased demand at the recently advanced prices with a firm position.

ACID CITRIC.—Quiet with price at about 1s. 11½d. per lb., less 5%.

CREAM OF TARTAR.—Steady at about 102s. per cwt. and in fair demand.

COPPER SULPHATE.—Unchanged with a steady enquiry.

FORMALDEHYDE.—A little easier at about £35 per ton, and in steady request.

LEAD ACETATE.—Lower at £42 per ton for white, with brown at £1 per ton less and in steady demand.

LEAD NITRATE.—Steady at about £33 per ton.

LIME ACETATE.—Unchanged.

LITHOPONE.—Steady at £19 15s. to £23.

POTASH CARBONATE.—Unchanged at £27 per ton for the 96–98% arsenic free quality.

PERMANGANATE OF POTASH.—In good demand and firm at 5½d. per lb. for B.P. needle crystals.

SODIUM ACETATE.—About £21 10s. to £22 per ton and in fair demand.

SODIUM BICHROMATE.—Firm at 3⅞d. per lb., and in steady request.

SODIUM HYPO SULPHITE CRYSTALS.—Commercial, £8 10s. to £9 per ton, photographic £14 15s. per ton with improved demand.

SODIUM NITRITE.—In steady demand at about £20 per ton.

SODIUM PRUSSIATE.—Firm at 4⅞d. to 5¼d. per lb., according to quantity, with a steady sale.

SODIUM SULPHIDE.—Unchanged at British makers' prices.

TARTAR EMETIC.—11d. per lb., and in small demand.

ZINC SULPHATE.—Unchanged at £13 10s. per ton.

Coal Tar Products

The coal tar product market remains unchanged from last week.

MOTOR BENZOL.—Quoted at about 1s. 5½d. to 1s. 6d. per gallon, f.o.r.

SOLVENT NAPHTHA.—Unchanged at about 1s. 2½d. to 1s. 3d. per gallon f.o.r.

HEAVY NAPHTHA.—Remains at about 1s. 1d. per gallon f.o.r.

CREOSOTE OIL.—Unchanged, at 3d. to 3½d. per gallon f.o.r. in the North, and at 4d. to 4½d. per gallon in London.

CRESYLIC ACID.—Quoted at 2s. per gallon for the 98/100% quality, and at 1s. 10d. per gallon ex works for the dark quality, 95/97%.

NAPHTHALENES.—Firelighter quality quoted at £3 10s. to £3 15s. per ton, the 74/76 quality at £4 to £4 5s. per ton, and the 76/78 quality at about £5 per ton.

PITCH.—Unchanged, at 45s. to 47s. 6d. per ton f.o.b. East Coast port.

The following additional prices have been supplied :—

CARBOLIC ACID.—Rather more inquiry has been noticed during the past week. Prices still remain at 7d. to 7½d. per lb. in bulk packing, according to quantity.

CRESYLIC ACID.—*Pale.*—98% is quoted at 2s. 1d. to 2s. 2d. per gallon. *Refined.*—2s. 7d. to 2s. 10d. per gallon.

ACETYL SALICYLIC ACID.—Business is moderate. Prices are unchanged at 2s. 9d. to 2s. 11d. per lb.

METHYL SALICYLATE.—1s. 3d. to 1s. 5d. per lb.

SACCHARIN.—43s. 6d. per lb., duty paid.

Nitrogen Fertilisers Market

Sulphate of Ammonia.—Export.—Despite the world-wide depression in agriculture, the demand for sulphate of ammonia continues satisfactory, and the price remains steady at £8 3s. 6d. to £8 5s. per ton f.o.b. U.K. port, in single bags. In Continental countries the demand for prompt delivery has been satisfactory, and the cheap offers of which one heard earlier in the year, seem to have disappeared. *Home.*—Merchants are now receiving large orders for sulphate, and although some of them consider that the demand will be smaller than last year, there seems to be a large volume of business, particularly in the South and Midlands. It is understood that Scottish merchants have also commenced to place big orders. The price remains unchanged.

Nitrate of Soda.—Recent fine weather has stimulated the purchase of this product and a good move-out has been reported from Liverpool and Bristol. The price—which is the same as that for sulphate—remains unchanged.

Latest Oil Prices

LONDON, March 12.—LINSEED OIL was easy at 10s. to 17s. 6d. per ton decline. Spot, ex mill, unchanged at £38 ; March, £34 2s. 6d. ; March-April, £34 5s. ; May-August, £34 7s. 6d. ; September-December, £34 5s., naked. RAPE OIL was quiet. Crude, extracted, £36 ; technical, refined, £37 10s., naked, ex wharf. COTTON OIL was steady. Egyptian crude, £28 ; refined common edible, £32 10s. ; deodorised, £34 10s., naked, ex mill. TURPENTINE was quiet and unchanged. American, spot, 43s. 3d. ; April-June, 43s. 6d.

HULL.—LINSEED OIL.—Spot to August, £35 5s. COTTON OIL.—Naked Egyptian crude, spot, £28 5s. ; edible refined, spot, £31 5s. ; technical, spot, £31 ; deodorised, spot, £33 5s. PALM KERNEL OIL.—Crude, naked, 5½ per cent., spot, £30 10s. GROUNDNUT OIL.—Crushed/extracted, spot, £33 ; deodorised, spot, £37. SOYA OIL.—Extracted and crushed, spot, £30 10s. ; deodorised, spot, £34. RAPE OIL.—Crushed extracted, spot, £35 ; refined, spot, £37 per ton. TURPENTINE.—Spot, 45s. 9d. per cwt., net cash terms, ex mill.

South Wales By-Products

THERE is no change in South Wales by-product activities. Pitch continues to be quiet, only a small amount of business being done round about 45s. to 47s. per ton delivered. Creosote has weakened further, values ranging from 2½d. to 3⅜d. per gallon. Motor benzol remains in fair request at from 1s. 4d. to 1s. 6d. per gallon. Road tar has a slightly better call, with quotations easier at from 10s. to 12s. per 40-gallon barrel. Naphthas are unchanged. Solvent has a moderate call at from 1s. 3d. to 1s. 5d. per gallon, but heavy is slow at from 11d. to 1s. 1d. per gallon. Sulphate of ammonia has a small call round about £10 2s. per ton delivered. Refined tars are unchanged, both coke-oven and gasworks tar having a fair demand with quotations unchanged. Patent fuel exports are moderate. Patent fuel prices, for export, are : 22s. 6d. per ton, ex ship Cardiff ; 21s., ex ship Newport ; and from 20s. to 21s. ex ship Swansea. Coke prices for furnace and foundry grades are unchanged at all South Wales ports.

Scottish Coal Tar Products

CRESYLIC acid has been moving in fair quantities during the week, and prompt supplies are scarce in Scotland. Other products are inactive, with prices steady.

Cresylic Acid.—There has been a good demand for prompt supplies and prices show a slight advance, as follows : Pale, 99/100% 1s. 11d. to 2s. per gallon ; pale, 97 99%, 1s. 10d. to 1s. 11d. per gallon ; dark, 97/99%, 1s. 8½d. to 1s. 9½d. per gallon ; all free on rails works. High-boiling acid is easy at 1s. 9½d. to 1s. 11½d. per gallon.

Carbolic Sixties.—There is no change to report, price being nominal at about 2s. 3d. to 2s. 5d. per gallon.

Creosote Oil is very quiet, and wood preserving qualities are accumulating at the makers' works. Acid-bearing oils are steady. Specification oil is lower at 3d. to 3½d. per gallon ; gasworks ordinary is steady at 2⅞d. to 3⅜d. per gallon ; and washed oil is easy at 3d. to 3½d. per gallon, all in bulk ex works.

Coal Tar Pitch is unchanged in price at 47s. 6d. per ton, f.a.s. Glasgow. There have been many inquiries from foreign buyers, but few, if any, orders. Home price is about 50s. to 52s. 6d. per ton.

Blast Furnace Pitch.—This article is very quiet and controlled prices are unchanged.

Refined Coal Tar.—It is anticipated that some large orders will be received from the county authorities shortly. Tenders have been invited and the quotations are steady at 3⅞d. to 4⅜d. per gallon.

Blast Furnace Tar is 2⅜d. per gallon, f.o.r. works.

Crude Naphtha is scarce for prompt delivery, and value is nominal at 4¾d. to 5¾d. per gallon, according to quality and district.

Water White Products are quiet. 90/160 solvent is easy at 1s. 2d. to 1s. 3d. per gallon ; and 90/190, 1s. to 1s. 1d. per gallon. Motor benzol is steady at 1s. 6¼d. to 1s. 6⅜d. per gallon in bulk.

Scottish Chemical Market

The following notes on the Scottish Chemical Market are specially supplied to THE CHEMICAL AGE *by Messrs. Charles Tennant and Co., Ltd., Glasgow, and may be accepted as representing the firm's independent and impartial opinions.*

Glasgow, March 12, 1930.

BUSINESS during the past week in the Scottish Chemical Market has maintained the same activity as we last reported, with the exception that inquiries for home consumption are less numerous. No important changes in prices have taken place.

Industrial Chemicals

ACETONE, B.G.S.—£71 10s. to £80 per ton, ex wharf, according to quantity. Inquiry remains satisfactory.

ACID ACETIC.—This material is still scarce for immediate supply but prices remain unchanged as follows: 98/100% glacial, £56 to £67 per ton, according to quality and packing, c.i.f. U.K. ports; 80% pure, £37 10s. per ton, ex wharf; 80% technical, £37 10s. per ton, ex wharf.

ACID BORIC.—Crystals, granulated or small flakes, £30 per ton. Powder, £32 per ton, packed in bags, carriage paid U.K. stations. There are a few fairly cheap offers made from the Continent.

ACID CARBOLIC, ICE CRYSTALS.—Quoted 8d. per lb. delivered.

ACID CITRIC, B.P. CRYSTALS.—Quoted 2s. per lb., less 5%, ex store, prompt delivery. Rather cheaper offers for early delivery from the Continent.

ACID HYDROCHLORIC.—Usual steady demand. Arsenical quality 4s. per carboy. Dearsenicated quality, 5s. 6d. per carboy, ex works, full wagon loads.

ACID NITRIC, 80° QUALITY.—£24 10s. per ton, ex station, full truck loads.

ACID OXALIC, 98/100%.—On offer at same price, viz.: 3¼d. per lb., ex store. Offered from the Continent at 3¼d. per lb., ex wharf.

ACID SULPHURIC.—£2 15s. per ton, ex works, for 144° quality; £5 15s. per ton for 168°. Dearsenicated quality, 20s. per ton extra.

ACID TARTARIC, B.P. CRYSTALS.—Quoted 1s. 4d. per lb., less 5%, ex wharf. On offer for prompt delivery from the Continent at 1s. 4⅛d. per lb., less 5%, ex wharf.

ALUMINA SULPHATE.—Quoted at round about £7 10s. per ton, ex store.

ALUM, LUMP POTASH.—Now quoted £8 7s. 6d. per ton, c.i.f. U.K. ports. Crystal meal about 2s. 6d. per ton less.

AMMONIA, ANHYDROUS.—Quoted 7½d. per lb., carriage paid. Containers extra and returnable.

AMMONIA CARBONATE.—Lump quality quoted £36 per ton. Powdered, £38 per ton, packed in 5 cwt. casks, delivered U.K. stations or f.o.b. U.K. ports.

AMMONIA LIQUID, 880°.—Unchanged at about 2½d. to 3d. per lb., delivered according to quantity.

AMMONIA MURIATE.—Grey galvanisers' crystals of British manufacture quoted £21 to £22 per ton, ex station. Fine white crystals offered from the Continent at about £17 5s. per ton, c.i.f. U.K. ports.

ANTIMONY OXIDE.—Rather easier and Spot material now obtainable at round about £34 per ton, ex wharf. On offer for prompt shipment from China at £30 per ton, c.i.f. U.K. ports.

ARSENIC, WHITE POWDERED.—Quoted £18 per ton, ex wharf, prompt despatch from mines. Spot material still on offer at £19 15s. per ton, ex store.

BARIUM CHLORIDE.—In good demand and price about £11 per ton, c.i.f. U.K. ports. For Continental material price would be £10 per ton, f.o.b. Antwerp or Rotterdam.

BLEACHING POWDER.—British manufacturers' contract price to consumers unchanged at £6 12s. 6d. per ton, delivered in minimum 4-ton lots. Continental now offered at about the same figure.

CALCIUM CHLORIDE.—Remains unchanged. British manufacturers' price, £4 15s. per ton to £5 5s. per ton, according to quantity and point of delivery. Continental material on offer at £3 12s. 6d. per ton, c.i.f. U.K. ports.

COPPERAS, GREEN.—Unchanged at about £3 10s. per ton, f.o.r. works or £4 12s. 6d. per ton, f.o.b. U.K. ports.

FORMALDEHYDE, 40%.—Now quoted £35 per ton, ex store. Continental material on offer at about £34 per ton, ex wharf.

GLAUBER SALTS.—English material quoted £4 10s. per ton, ex station. Continental on offer at about £3 5s. per ton, ex wharf.

LEAD, RED.—Price now £37 10s. per ton, delivered buyers' works.

LEAD, WHITE.—Quoted £37 10s. per ton, c.i.f. U.K. ports.

LEAD ACETATE.—White crystals quoted round about £39 to £40 per ton, ex wharf. Brown on offer at about £2 per ton less.

MAGNESITE, GROUND CALCINED.—Quoted £8 10s. per ton, ex store. In moderate demand.

METHYLATED SPIRIT.—Industrial quality 64 O.P. quoted 1s. 4d. per gallon, less 2½%, delivered.

POTASSIUM BICHROMATE.—Quoted 4¼d. per lb. delivered U.K. or c.i.f. Irish ports, with an allowance for contracts.

POTASSIUM CARBONATE.—Spot material on offer at £26 10s. per ton, ex store. Offered from the Continent at £25 5s. per ton, c.i.f. U.K. ports.

POTASSIUM CHLORATE, 99¾/100%.—Powder quoted £25 10s. per ton, ex wharf. Crystals 30s. per ton extra.

POTASSIUM NITRATE.—Refined granulated quality quoted £19 2s. 6d. per ton, c.i.f. U.K. ports. Spot material on offer at about £20 10s. per ton, ex store.

POTASSIUM PERMANGANATE, B.P. CRYSTALS.—Quoted 5¼d. per lb., ex wharf.

POTASSIUM PRUSSIATE (YELLOW).—Spot material quoted 7d. per lb., ex store. Offered for prompt delivery from the Continent at about 6¾d. per lb., ex wharf.

SODA, CAUSTIC.—Powdered, 98/99%, £17 10s. per ton in drums, £18 15s. per ton in casks. Solid, 76/77%, £14 10s. per ton in drums, and £14 12s. 6d. per ton for 70/72% in drums, all carriage paid buyers' stations, minimum 4-ton lots, for contracts 10s. per ton less.

SODIUM BICARBONATE.—Refined recrystallised, £10 10s. per ton, ex quay or station. M.W. quality 30s. per ton less.

SODIUM BICHROMATE.—Quoted 3⅝d. per lb., delivered buyers' premises with concession for contracts.

SODIUM CARBONATE. (SODA CRYSTALS).—£5 to £5 5s. per ton, ex quay or station. Powdered or pea quality 27s. 6d. per ton extra. Light soda ash £7 13s. per ton, ex quay, minimum 4-ton lots with various reductions for contracts.

SODIUM HYPOSULPHITE.—Large crystals of English manufacture quoted £8 17s. 6d. per ton, ex station, minimum 4-ton lots. Pea crystals on offer at £14 15s. per ton, ex station, minimum 4-ton lots. Prices for this year unchanged.

SODIUM NITRATE.—Chilean producers are now offering at £10 2s. per ton, carriage paid buyers' sidings, minimum 5-ton lots, but demand in the meantime is small.

SODIUM PRUSSIATE.—Quoted 5¼d. per lb., ex store. On offer at 5d. per lb., ex wharf, to come forward.

SODIUM SULPHATE (SALTCAKE).—Prices 55s. per ton, ex works, 57s. 6d. per ton delivered for unground quality. Ground quality 2s. 6d. per ton extra.

SODIUM SULPHIDE.—Prices for home consumption. Solid, 60/62%, £9 15s. per ton. Broken, 60/62%, £10 15s. per ton. Crystals, 30/32%, £7 17s. 6d. per ton, all delivered buyers' works on contract, minimum 4-ton lots. Special prices for some consumers. Spot material 5s. per ton extra.

SULPHUR.—Flowers, £12 per ton; roll, £10 10s. per ton; rock, £9 5s. od. per ton; ground American, £9 5s. per ton, ex store.

ZINC CHLORIDE, 98%.—British material offered at round about £20 per ton, f.o.b. U.K. ports.

ZINC SULPHATE.—Quoted £10 per ton, ex wharf.

NOTE.—The above prices are for bulk business and are not to be taken as applicable to small parcels.

Survey of National Coal Resources

IN connection with the Physical and Chemical Survey of the National Coal Resources, which is one of the important aspects of the fuel research work of the Department of Scientific and Industrial Research, the Department has recently appointed a committee to deal with the West Yorkshire Coal Area, with the following constitutution:—

Representing the West Yorkshire Coal Owners' Association.—Mr. H. F. Smithson, Mr. D. H. Currer Briggs, Mr. W. D. Lloyd, Mr. G. F. F. Eagar.

Midland Institute of Mining Engineers.—Captain T. A. Adam.

Local Scientists.—Professor J. W. Cobb, Professor J. A. S. Ritson.

Geological Survey of Great Britain.—Mr. C. E. N. Bromehead.

Department of Scientific and Industrial Research.—Dr. C. H. Lander (ex officio) (Director of Fuel Research); Dr. F. S. Sinnett (ex officio) (Superintendent of the Coal Survey).

Arrangements are in hand for the establishment of a further laboratory to deal with the coalfields of Warwickshire, Cannock Chase and South Staffordshire and Leicestershire. When these have been completed the Survey will embrace areas producing 96 per cent. of the coal of Great Britain. The coal from the remaining coalfields will be dealt with at one of the above survey laboratories or at the fuel research station.

Manchester Chemical Market

(From Our Own Correspondent.)

Manchester, March 13, 1930.

Although in the aggregate a moderate business in chemicals is reported here, traders generally are complaining of the patchy nature of a large proportion of the trade that is going through, and of the keen competition in a number of lines. A not unexpected development during the past week in view of the persistent weakness of the lead market of late has been a fall in the lead products. Apart from this and also one or two minor fluctuations in other lines, values almost throughout the range of chemicals have been reasonably steady.

Heavy Chemicals

The movement of sulphide of sodium since the last report has been on a moderate scale, chiefly against contract commitments, with the 60-65 per cent. concentrated solid material on offer at round £10 per ton and the commercial quality at about £8. Phosphate of soda is not particularly active at the moment, but at about £11 per ton for the dibasic sort prices keep up. Caustic soda is firm at from £12 15s. to £14 per ton, in contracts and according to grade, and a fairly steady demand is reported. A fair business is also going through in the case of bicarbonate of soda and alkali, current quotations for which are at round £10 and £6 per ton, respectively. With regard to chlorate of soda, the demand in this section during the past week has been on a somewhat quiet scale, but offers are well held at from £25 to £27 per ton, ex store and according to quantity. Hyposulphite of soda is selling in moderate quantities, with the photographic quality at £15 per ton and the commercial material quoted at from £9 to £9 10s. A quietly steady business is being put through in bichromate of soda, which is well held at 3⅝d. per lb., less 1 to 2½ per cent., according to quantity. Saltcake and Glauber salt are in moderate demand, with offers in the neighbourhood of £2 15s. per ton.

A fair inquiry is about in the case of yellow prussiate of potash, which keeps firm at from 6¾d. to 7¼d. per lb. Permanganate of potash continues inactive, but there has been no change in prices, the B.P. grade being quoted at 5⅜d. per lb. and the commercial at about 5¼d. Carbonate of potash meets with a moderate demand, with offers down to £26 per ton. With regard to caustic potash, there has been no further alteration in the price position, and a quiet business is passing at from about £30 10s. per ton. Bichromate of potash is quite firm at 4⅜d. per lb., and buying interest in this material is sustained. Chlorate of potash at the moment is rather slow, but quotations in this section are well held at from £26 to £28 per ton, according to quantity.

There is a quiet demand about for arsenic, but values are reasonably steady on the basis of £16 per ton at the mines for white powdered Cornish makes. Buying interest in sulphate of copper both on home and export account is on moderate lines only, with values in the neighbourhood of £26 5s. per ton, f.o.b. Inquiry for the lead products is somewhat subdued and, at round £38 and £37 10s. per ton for white and brown acetate and £32 for nitrate, quotations are on a generally lower level than they were a week ago. There has been little change in the position of the acetates of lime, which are selling in comparatively small quantities at about £16 per ton for the grey material and £7 10s. for the brown.

Acids and Tar Products

Oxalic acid meets with a moderate amount of inquiry and values are steady at from £1 12s. 6d. per ton, ex store. Neither in citric nor tartaric acid is there much weight of business going through and at about 1s. 10½d. and 1s. 3½d. per lb. respectively the tendency is not too strong. Acetic acid is steady and in fair demand at £36 per ton for the 80 per cent. commercial quality and about £66 for the glacial.

Among the by-products, pitch is still on offer at about 47s. 6d. per ton, f.o.b., but current demand for this material is only on quiet lines. Creosote oil, also, is comparatively slow, with offers unchanged on the week at 3½d. to 4d. per gallon, naked. There is a moderate inquiry about for crystal carbolic acid at from 7d. per lb., f.o.b., and also for 60's crude at about 2s. 6d. per gallon, at works. A fair trade is being put through in solvent naphtha, values of which are at round 1s. 3d. per gallon.

Company News

Amalgamated Zinc (de Bavay's).—A dividend at the rate of 8 per cent. per annum is announced for the six months ended December 31 last, on the whole of the issued shares, payable on April 10.

Tehidy Minerals.—The profit for 1929 was £9,609, to which is added £7,125, brought forward. A final dividend of 3d. per share, free of income-tax is recommended, leaving a credit balance of £9,384 to be carried forward.

Hadfields, Ltd.—The profit and loss account for the year ended December 31 last shows a profit of £112,992. The directors recommend a payment of 2½ per cent., less tax, on the ordinary shares, carrying forward a balance of £92,295, compared with £90,571 brought in.

Achille Serre.—The net result of operations for the year ended December 31 last is a loss of £16,932. The report states that the loss is due to the difficulty and expense incurred in the removal of the works from Hackney Wick to Walthamstow. After deducting the loss from the balance brought forward there remains to be carried forward £5,493.

Cooper, M'Dougall and Robertson.—After charging colonial income-tax, interest on loans, and managing directors' remuneration, the profits for the year ended September 30 last declined from £262,082 to £253,816. A balance of £42,634 was brought in making a total credit of £296,450. Income-tax absorbed £10,391, and pensions and expenses required £13,798, and the directors have again written £10,000 off patents and carried £30,000 (the same) to general reserve, and £10,000 (the same) to special depreciation reserve. It is proposed to pay a final dividend on the ordinary shares of 8 per cent., again making 15 per cent. for the year, leaving a balance of £58,643 to be carried forward.

Pinchin, Johnson and Co.—The net profit for 1929 amounted to £462,349 (after providing for directors' fees of £3,650) and compares with £422,796 (before providing for directors' fees) for 1928. During the year the directors have carried to capital reserve £48,310, being a balance of surplus capital assets acquired, and, in addition, propose to allocate a further £20,000 to reserve from the profit and loss account. The year's dividend on the preference absorbs £26,000, and the directors recommend a final dividend on the ordinary shares of 20 per cent., making a total of 30 per cent. for the year, as for 1928, but requiring on this occasion £331,190, against £233,495 for 1928. The balance carried forward is £84,446, against £80,103 brought in.

United Turkey Red Co., Ltd.—The report for the year to December 31, 1929, shows that, after providing fully for repairs, depreciations, all charges and contingencies, the profit for the year amounted to £82,301, to which falls to be added the balance carried forward from last year, £44,552, making £126,853. After paying the year's dividends on the 4 per cent. first cumulative preference shares, £23,295, and on the 5½ per cent. second cumulative preference shares, £18,768, there remains £84,790. The directors have paid an interim dividend of 3 per cent., less income-tax, on the ordinary shares, £20,475, and they now recommend a final dividend of 3 per cent., subject to tax, on the ordinary shares, absorbing £20,475, and carrying forward a balance of £43,840. Last year the profit amounted to £124,814 and a dividend of 10 per cent., less tax, was paid to the ordinary shareholders.

United Glass Bottle Manufacturers.—The accounts for the year ended December 31 last show that after payment of debenture interest, providing for depreciation and income tax, and including interest on investments, profits amounted to £146,751, which compares with £104,055 for 1928. A sum of £9,827, against £9,010, has been transferred to debenture redemption reserve; £10,000, against £15,000, to general reserve; and £50,000 to capital reserve; while the allocation to staff benevolent fund amounts to £8,000, in contrast with £5,000. The dividend on the preferred ordinary shares is maintained at 7½ per cent., and the directors now recommend a dividend on the ordinary shares of 7½ per cent., which compares with 5 per cent. for the preceding twelve months. The carry-forward amounts to £44,545, against £42,668 brought in. Last year £16,000 was transferred to special expenditure in respect of debenture conversion, and £3,750 was applied in respect of expenses of preferred ordinary issue.

EXTRACT FROM ADDRESS delivered at a Meeting in Britain of British Manufacturers, reported in "The Chemical Age" (p. 118), February 8, 1930:

> "Those who had opportunities of visiting chemical works on the Continent would agree that, as regards the quality of the plant and the chemical engineering layout and so on, the continental manufacturers were second to none."

As Chemical Plant Manufacturers, we disagree in the most emphatic terms.

We possess testimony from Continental plant users that our Evaporators, Dryers and Solvent Extraction Plant are not only equal to, but infinitely superior to, Continental Plant.

Let Chemical Manufacturers confide in and co-operate with British Engineers, and British brains and originality, British efficiency and British construction will prove the reproach unjustified.

IF YOU ARE INTERESTED IN:

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Fat Splitting and Fatty Acid Distillation Plant,
Fish Offal Plant,
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Caustic Soda Plant,
Soda Recovery Plant,
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Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

County Court Judgments

[NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.]

EAGLE, Henry, Killingowrth House, Benton, manufacturing chemist. (C.C., 15/3/30.) £41 3s. 6d. February 1.

LEWIS BATLEY AND CO., Gorsey Works, Upper Brook Street, Stockport, manufacturing chemists. (C.C., 15/3/30.) £12 9s. 8d. January 11.

Mortgages and Charges

*[NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.]*

FISON, PACKARD AND PRENTICE, LTD. (late Packards and James Fison (Thetford), Ltd., Packard and Fisons (Thetford), Ltd., and Edward Packard and Co., Ltd.), Ipswich, manufacturers of sulphuric acid, etc. (M., 15/3/30.) Registered February 25, Trust Deed dated February 4, 1930, securing £34,500 as collateral security for £34,500 debentures issued by Joseph Fison and Co., Ltd. (now in liquidation); general charge. *£68,800. November 16, 1928.

GLOSSIT CO., LTD., Darwen, polish manufacturers. (M., 15/3/30.) Registered March 3, £800 mortgage (section 81, 1929 Act), to W. R. Carns, 44, Gorse Road, Blackpool; charged on Bank Top Works, Darwen.

HARRIS (JOSEPH), LTD., Birmingham, dyers and cleaners (M., 15/3/30.). Registered February 25, £1,400, £855 8s. 11d. and £750 mortgages (section 81, 1929 Act) to Bank, Halifax Building Society and Birmingham District Branch I.O.O.F. M.U.; charged on properties at Birmingham.

LEEDS CHEMICAL CLEANING WORKS, LTD. (M., 15/3/30.) Registered February 24, series of £500 2nd debentures present issue £300; general charge. *£150. January 19, 1928.

New Companies Registered

CLEVELAND TAR DISTILLERS, LTD.—Registered as a "private" company on March 8. Nominal capital, £5,000 in £1 shares. Tar distillers and refiners at Skinningrove, to adopt an agreement with S. P. Bowen, D. M. Bowen and Pease and Partners, Ltd. Directors: S. M. Sutcliffe, Oakridge, White Knowle Road, Buxton; S. P. Bowen, J. A. Hodsman.

LEON FRENKEL, LTD.—Registered March 6. Nominal capital, £5,500 in £1 shares. To acquire from Leon Frenkel the business of a producer, manufacturer and dealer in olive and other oils, etc. A subscriber: F. L. Frenkel, 43, Roehampton Lane, London, S.W.15.

HULL CHEMICAL WORKS, LTD.—Registered March 10. Nominal capital, £15,000 in £1 shares. To acquire the business of manufacturers of disinfectants and soaps, etc., carried on by S. Earle and H. W. Mackrill at Hull as the "Hull Chemical Works Company." Directors: H. W. Mackrill, Lamworth Hall, Sutton-on-Hull, East Yorks; S. Earle.

T. T. TRADING CO., LTD., Aldwych House, Aldwych, W.C.—Registered as a "private" company on March 7. Nominal capital, £6,000 in £1 shares (5,000 7 per cent. non-cumulative redeemable preference and 1,000 ordinary). To import and sell Ten Test Fibre Board manufactured by the International Fibre Board, Ltd., of Canada, to adopt an agreement with C. B. Gabriel, to carry on the business of merchants, brokers, agents for and dealers in manufactured and raw materials, including pharmaceutical and medical, industrial and other preparations and articles, compounds, cements, oils, paints, pigments and varnishes, drugs, dyeware and building materials, etc.

Fooling About in the Works

How an I.C.I. Lad Lost His Life

THE Safety Handbook which has been issued to some groups in I.C.I. and is in preparation for the remaining groups contains a small section which points out the dangers of horse-play, or fooling, or practical jokes in the works. A most regrettable accident occurred in January in an I.C.I. factory. A small party of boys were returning from dinner and, as boys will, they were working off their high spirits. One of them was pretending to hit his companions with a steel bar and persisted in doing so though he was warned to put it down. He finally raised the bar and brought it into contact with a live electric wire carrying about 400 volts, and was electrocuted, dying immediately.

Such an accident, the *I.C.I. Magazine* states, cannot pass without comment in a company which is instituting a safety campaign in its factories. Horse-play and practical jokes in a factory are dangerous, and it is every worker's duty to point out these dangers to his mates and to do his best to put a stop to it.

High-spirited lads particularly are likely to be affected. There is a grown man employed in an I.C.I. factory who has now only one leg. When he was a mere boy of fifteen years of age he was a splendid specimen, and a favourite trick of his was to turn somersaults from railway trucks to the ground. One day the inevitable accident happened; it cost him a leg. He is now a works councillor, and is in no doubt about the necessity for a safety campaign.

At a big works recently a member of head office staff was visiting a packing shed with the works safety officer. The lads were coming back from their dinner and were indulging in the usual sham-fights. They were probably thoroughly annoyed when the safety officer spoke to them sharply, and pointed out that that was how accidents happened. Yet these lads were on a platform some four and a half feet above a railway track. If one of them had been pushed from the platform he might have broken his back.

An appeal to works councillors, safety men and all workers to take this matter up strongly, and, by example, and personal influence, to put an end once and for all to this very real source of danger, which has already cost the life of one of their fellow workers, is here made.

L.M.S. Research Advisory Committee

PRESIDING at the annual meeting of the London, Midland and Scottish Railway on February 28, Sir Josiah Stamp referred to the recent appointment of Sir Harold Hartley as director of scientific research and said the advisory committee which will meet from time to time to consider the programmes of research and their progress will be, under Sir Harold Hartley as chairman: Sir Harold Carpenter, F.R.S., Professor of Metallurgy in the Royal School of Mines; Sir Herbert Jackson, F.R.S., Emeritus Professor of Chemistry and Director of the British Scientific Instrument Research Association; Mr. W. Rintoul, joint research manager of Imperial Chemical Industries, Ltd.; Dr. Frank Smith, F.R.S., Secretary of the Royal Society and Secretary to the Department of Industrial and Scientific Research, together with certain of their own technical officers.

New Benn Books

AMONG the new books announced for early publication by Ernest Benn, Ltd., are the following:—*Economics of Safeguarding*, by Alexander Ramsay (8s. 6d.); *Richelieu*, by Hilaire Belloc (21s.); *English Speaking Freemasonry*, by Sir Alfred Robbins (10s. 6d.); *About Russia*, by Ernest J. P. Benn (6s.); *Naval Warfare*, by Admiral Sir H. W. Richmond (5s.); *The Collected Poems of Edward Thompson* (10s. 6d.); *Dr. Fogg*, by Norman Matson (6s.).